Electrical World

OCTOBER 3, 1942

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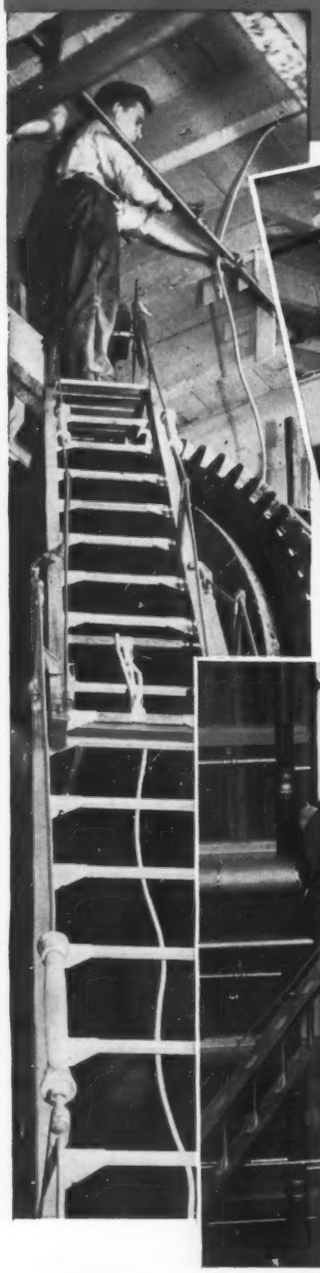

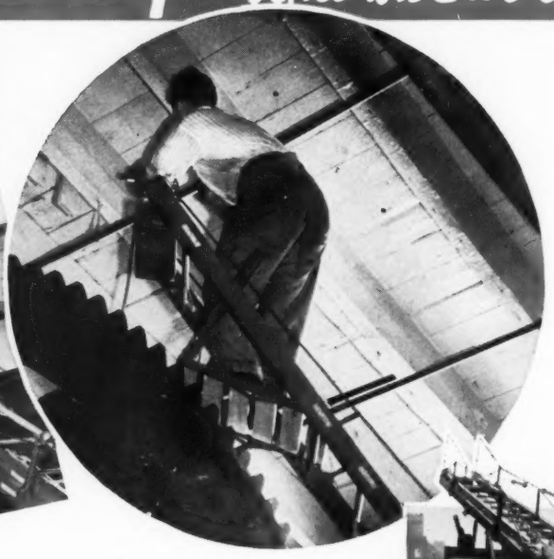

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Electrical World

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Recognition

From many a factory there proudly floats the Army-Navy E and on thousands of workers' jackets there stands forth the button for effort. They are the civilian counterpart of citations on the field of action for extra effort by members of our armed forces. These well-merited awards have no intrinsic value, yet they serve as incentives to others to do their utmost.

These awards, however, have been given only to manufacturing organizations. No electric utility has been given an Army-Navy E. Yet there is no manufacturing industry that was better prepared for the demands of war, that has delayed war production less or that has shown so little labor disturbance since the war began.

Why has there been no recognition? It would almost appear as though the Army and Navy were conscious of the fact that electric utility employees have inbred in them the fixed belief that regardless of anything else service must be maintained and that no incentive is needed to encourage them to do their best. Like our fighting men, they give no thought to themselves when there is a battle to be won.

It would be difficult, of course, to signal out any one or two or three utilities for such honors, because most all of them are doing A-1 jobs. They produce the only universal raw material of war production, without which every factory making war goods would have to stop. They make a raw material which cannot be stocked, yet which must be instantaneously available wherever and whenever and in whatever quantity wanted. Their men have been drafted, their requests for additional facilities more and more limited—yet they have never defaulted on the job.

Metals that could have been stored before the war, machinery and tools that might have been built—all developed shortages early. There has been no power shortage. In some areas there have been unprecedented rainfall deficiencies, but no war production was held up for want of electric energy. Electric utilities have outstripped all others in the race with winter to build up a fuel storage that would assure a constant flow of kilowatt-hours. There have been some cases of local outages due to breakdown. These have occurred in but a fraction of the properties, and even then the trouble was localized and did not last more than a few hours.

And, finally, while workmen in almost every other war industry have not let the needs of our soldiers and sailors deter them from exercising their right to strike or delay production, the employees of electric utilities have been true to their trust and the post-Pearl Harbor period has been a decided improvement over the previous ten months. Both labor and management have done an outstanding job of keeping the war production machinery running unceasingly.

Recognition or no recognition, no one can take away from them the knowledge that they have done a good job. It would be nice for the industry to get the award so well deserved, but in the inner recesses of one's conscience it is not the winning of the prize that counts nearly so much as the knowledge of being deserving of the recognition.

Meter Failures Guide REA to Correctives

Of 715,003 installations failures were 5.1 percent — Frequent lightning calls for better grounds and more indoor installations — Cyclometer registers evolved to acceptable performance

F. B. SCOTT, Head, Testing and Metering Unit, Technical Standards Division, REA*

THERE are more than a million watt-hour meters installed on REA-financed rural distribution systems in 45 states of the Union, Alaska and the Virgin Islands. A survey and analysis of the performance of these watt-hour meters will go a long way in deciding the proper methods of installation in rural areas throughout the United States. Performance data have been collected during 1941 involving 715,003 metering installations. The large majority of these installations use socket-type watt-hour meters installed on yard poles or on the side of buildings, the small remainder being composed of indoor installations of bottom-feed type watt-hour meters.

Preliminary analysis gives the following fairly definite indications as to the factors that are involved in causing meter failures:

1. It will not be possible to recommend one standard metering installation for all regions of the United States.

2. A definite reduction in the damage due to lightning can be made by proper metering installations and proper grounding of the meter and service equipment.

3. Steps should be taken to check all grounding resistances and to collect enough data on these resistances to be able to prepare an isometric chart of the United States showing grounding conditions.

4. The use of secondary lightning arresters is not justified in many cases because, unless the ground resistance is low, they do not operate effectively and, when the ground resistance is low, they are not needed.

5. An outdoor socket-type meter installation is not satisfactory in some sections of the country where there is high lightning incidence or where the ambient temperature range is extremely wide, unless some additional protection is provided.

No attempt is made here to present a complete analysis of the survey, only the highlights are presented with a minimum of figures:

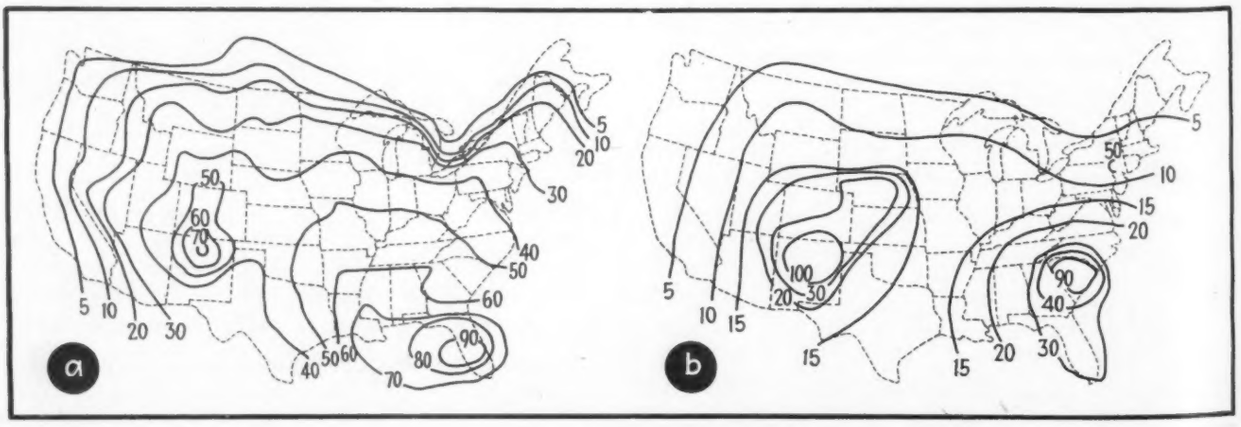
REA-financed systems reporting 630
Total meters installed (all makes) 715,003

Meter Failures per Annum		Lowest for Any One Region	Highest for Any One Region
Lightning	1.72%	0.50%	5.54%
Moisture	0.16%	0.02%	0.36%
Def. mat'l.....	2.16%	0.28%	8.18%
Overloads	0.04%	0.00%	0.10%
Fire	0.32%	0.04%	0.64%
Other	0.70%	0.32%	1.24%
Total	5.10%		

The lowest and highest percentages relate to the ten regions into which REA systems are segregated. The range of these percentages shows clearly that certain types of failures are more prevalent in some regions than in others.

Outdoor installation of socket-type watt-hour meters was the standard

* Adaptation of paper recently presented to Southeastern Metermen's Association at University of Florida, Gainesville.



METER DAMAGE by lightning occurs where isoceraunic level is high and ground resistances unfavorable

(a) Isoceraunic contours for average number of thunderstorm days per year from 1904 to 1935. From monthly *Weather Review*, 1935.

(b) Isometric plot of meter failures on REA projects from January 1, 1941, to June 30, 1941. All figures relative to New Mexico (as 100), which had the highest rate.

REA installation until the year 1940. During that year a change was made and some 50,000 indoor installations have been made combining the meter with the service equipment. These indoor installations were made only on new systems, while extensions to older systems continued to use the outdoor type of installation in most cases. This change in recommendations was made because of the following conditions: (1) Field reports indicated a large number of meter failures due to lightning, moisture and general outdoor exposure. (2) The consumers on a majority of the systems were reading their own meters and mailing the readings to the system office and therefore an indoor installation would be a convenience for them. (3) The systems were furnishing consumers with service equipment so that proper coordination with the distribution line and transformer protective devices could be maintained and this service equipment must necessarily be installed indoors.

Installation Program

Following is an outline of the present methods of meter installations on REA-financed systems:

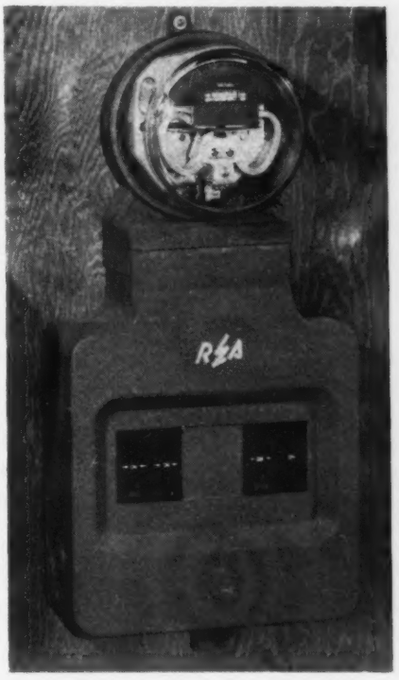
1. Yard Pole Installations:
(a) Socket-type meter and socket.
(b) Type "A" meter and meter inclosure.
2. Indoor Installations:
(a) Socket-type meter and socket base containing from two to six circuit breakers.
(b) Type "A" meter and meter base containing from two to six circuit breakers.
3. Indoor-Outdoor Installations:
(a) Socket-type meter and socket installed on outside of building, service center installed indoors with two to six circuit breakers.
(b) Type "A" meter and meter inclosure installed on outside of building, service center installed indoors with two to six circuit breakers.

All meter installations are grounded at the service head, the ground going from the neutral wire directly to a driven ground. The neutral wire of the service-entrance cable is also connected at this point. With this method any current discharge due to lightning surges does not pass through the meter inclosure.

The circuit breakers used are of the magnetic or thermal-magnetic type designed with definite time-current characteristics to insure coordination with the secondary protection at the transformers. The value of such coordination can be appreciated when it is realized that a service call to replace a transformer fuse may mean a trip of 30 to 40 miles.

Watt-hour meters of five manufacturers are included in this survey. The Stewart-Warner Corporation started to furnish meters to REA-financed systems in 1940. There are approximately 25,000 of this new make of meter included in this survey, the remainder being fairly equally divided between the four other makes.

Reports received indicate that the total amount of meter failures amounted to 5.1 percent per annum of the meters installed. Of this amount only 0.5 percent were reported



INDOOR UNIT can be expanded to contain up to six breakers

to be totally destroyed, half of them by fire when the metering equipment burned with the buildings. The rest of those totally destroyed were divided among lightning, overload, mechanical injury and freak accidents caused by almost anything from theft to tornadoes. These figures indicate that the number of meters which were totally destroyed due to electrical or mechanical reasons is very small and no large reduction of failures can be accomplished in this group.

Defective material was reported to be responsible for the failure of 2.16 percent per annum. This high percentage was due almost entirely to the development of satisfactory cyclometer-type registers for all makes of meters. In all cases registers that were defective in design or operation have been replaced by the manufacturers without charge and systems were reimbursed for labor costs involved in the replacements. At the present time all design difficulties would seem to have been overcome. The large majority of defective registers have been replaced and no further serious future trouble of this sort is anticipated. Therefore, failures due to defective material may be expected to be very small from now on.

Lightning and Grounds

Lightning caused the next highest percentage of failures, being 1.72 percent per annum. This percentage was very high in the southeastern states of Florida, Georgia, Alabama and South Carolina, being slightly over 5 percent per annum. These states are in an area where lightning is very frequent, which accounts for this high percentage of failures.

The accompanying isometric chart is based on the number of lightning failures occurring on REA systems as indicated from our survey. The figures on the chart are relative and do not indicate the number of failures. Since the state of New Mexico had the largest percentage of failures due to lightning, it is shown as 100, and the failures in other areas are in direct proportion.

There is a region of high lightning occurrence in the middle of Florida. However, as shown in the isometric chart, the area of high meter failures is shifted northward to South Carolina. While it is known that the ground resistance in many parts of Florida is high, the ground resistances northward into the Carolinas are relatively higher and may account for this shift. A similar situation was noted in the state of Texas. The worst lightning area so far as meter failures are concerned occurs in New Mexico, where lightning is frequent and ground resistances are very poor.

High ground resistances contribute greatly to many of the meter failures due to lightning. It was found in the past from equipment failure reports that many systems do not have the proper ground resistance testing equipment and therefore have little idea as to the condition of their grounds. Also, after a piece of equipment has failed due to lightning very few ever investigate the grounding even when they have the necessary instruments.

PRIORITIES PROBLEMS

RX WRITE, DON'T TELEGRAPH—unless it's really urgent! That's the advice of the WPB power division's priorities section to utilities sending in applications for ratings. Telegraphic application and reply is intended to be reserved for actual breakdown emergencies where a day of delay means actual loss of a day's production. If utilities "debase" the urgency of the telegraphic procedure, real hardship cases may get lost in the shuffle.

P-46 Inventory Base

Case No. 10

In the early days of the utility priority order P-46 it was optional in calculating inventory base under Section F of the order whether direct charge items were included or excluded. Utilities which made a practice of purchasing some materials for use on particular maintenance jobs without charging these items through stores were permitted to exclude such purchases both from base inventory and withdrawals, and from current deliveries, withdrawals and inventories.

With the tightening up by Washington of controls over use of critical materials this can no longer be done. Utilities must, at least for P-46 reports, route all acceptances of materials and all use of materials through the stores account and report them as deliveries and withdrawals.

This leads to the question which has been raised by several companies in letters to the WPB power division: What about the inventory base? Typical is the case of a utility whose second quarter PD-194 report showed, including direct charge items, use of several thousand dollars worth of line material in excess of the company's P-46 base which excluded a large amount of direct charge material that had been used in the 1940 base period. The utility was thus in apparent violation of P-46.

With the change in P-46 procedure requiring inclusion of direct charge material, however, the utility is entitled to recalculate its 1940 base to add in the excluded items. In instances such as cited here, where recalculation will substantially change the base, this should be done. Failure to do so either unnecessarily restricts the utility's permissible operations under P-46 now, because maintenance activities are limited in any quarterly period to 100 percent of the dollar volume of the base, or places the company in apparent violation of the order.

PD-1A's Question No. 8

Case No. 11

Because it is a catch-all application form, the PD-1A priority blank questions often are inadequate for presenting a full picture of the need for the rating sought. This is frequently true with respect to utilities inasmuch as, of necessity, the PD-1A is geared to commodities rather than to services.

In instances where the PD-1A questions prove ill-fitted to explain why a rating is needed, it is advisable to attach a brief letter outlining the situation for the WPB analyst who is to handle the application. Another helpful procedure is to supply answers to Question No. 8 (applicable to capital equipment cases) even when the application is only for repair parts.

An illustrative example was the application of a utility for a rating with which to obtain repair parts for an automatic stoker. The original application arrived with no data to indicate whether the stoker served part of the utility's base capacity or its reserve capacity, no data to indicate how many hours a week the particular stoker is used, nor how the utility was accomplishing the work which the repaired stoker would do. The power division wrote the utility for this information—was told that the stoker in need of repairs was the one firing the company's most efficient boiler and that all of the company's equipment is regularly in use at least part time. The rating was granted.

All of the information requested in the letter could have been supplied in the first application by providing the data called for by Question No. 8.

Reuse of Materials

Case No. 12

Two utilities in neighboring states recently, by coincidence, sent to WPB's power division somewhat similar requests for interpretations under Order P-46 of line projects they desired to undertake. One project was OK'd and one turned down; the different treatment illustrates aptly one problem involving the extent to which reuse of existing material is permitted under wartime regulations.

Each utility had a dead line on its distribution system, one about a mile long and the other something less than a mile. The first company wanted to take down its line and restring it along a new route nearby which would, in part, extend its service area. The second desired to restring the line in another portion of its system to replace a line in use but needing extensive repairs.

P-46 prohibits service extensions on the principle that there is no copper—even already fabricated copper—which can justifiably be spared for new operations not vital to the war effort. P-46 does, however, permit maintenance and repair of existing distribution systems. On this basis the power division turned down the project of the utility which wanted to restring its wire over another route, but told the utility which intended to substitute its dead line for a line in need of repairs to go ahead.

No application to Washington is required for this latter type of maintenance work.

Relocating Lines

Case No. 13

Construction of new express highways, access roads and grade separations in connection with new war plants frequently requires relocation of utility lines, usually with little advance notice. A case in point involved a huge new bomber factory and airfield which required the closing of several existing roads and the construction of new ones leading

to and circling the fenced off area.

The utility wrote to WPB's power division asking what authorization was required to move its lines inasmuch as, in some instances, the new lines would have to be longer than the old and in all cases the relocation exceeded 250 ft. The reply was that no Washington approval is required so long as no new customers are involved and the capacities of the lines are not increased. Also, it is permissible for a utility to make up to $500 worth of net materials improvements in the new line so long as this improvement is not an increase in the capacity.

In this connection it is worth noting that utilities may also relocate more than 250 ft. of line without Washington approval as a means of providing work for line crews, where such relocation is desirous because of tree conditions, future road widening plans and the like. The new line must, of course, be of the same capacity and new customers cannot be added.

Deferred Projects Inventory

Case No. 14

With the continual tightening up in Washington on new construction of all kinds, many utilities find they are unable to complete a job already started or one for which a portion of the materials have been acquired. This creates a problem of properly handling the inventory of materials —how to report them, how to make them available for war use.

The recent WPB power division program limiting expansion of generator plant has produced a number of such instances. Typical is that of a utility which had started construction of the necessary central station position for a new unit and had a goodly share of the materials on hand in anticipation of arrival of the generator and other equipment a few months hence. The WPB program dropped this generator and the utility was obliged to stop work on the project.

The company wrote the power division for instruction regarding reporting of the material on hand—which up to then had been segregated from the inventory reported under P-46 on Form PD-194 because it was acquired for a rated construction project. The power division instructed the company to add the material to its P-46 inventory and report it as surplus inventory available for sale to other utilities under the procedure established for the second quarter PD-194 reports.

The same procedure applies for all material "frozen" as a result of projects halted or deferred by WPB order, whether the material was obtained under a PD-1A, Pd-200 or some other priority procedure.

Industrial Generator Goes to War

Case No. 15

Efforts to integrate non-utility power capacities with utility systems under Section B-3 of Order L-94 so as to increase the kilowatts and kilowatt-hours available for wartime needs are taking many directions. An example of one procedure considered likely to be duplicable in a number of places is that of the utility which has negotiated for the power output of a civilian industry war casualty.

The industrial plant, a specialty glass factory, has been practically shut down because of inability to get materials and there is little chance that it can be converted to war work. The factory has, however, a modern 15,000-kw. steam generating plant never before tied in with the utility system. In reporting to WPB under L-94, the utility suggested that the industrial generators be equipped for synchronous operation with its system so that the glass factory power plant could be virtually another central station.

WPB's power division agreed and a contract has been negotiated whereby the utility purchases 10,000 kw. of continuous firm power and has the right to take the other 5,000 kw. in emergencies. The industrial company will operate its own plant, with its own crew, in parallel with the utility system, selling power at the bus. Price agreed upon is the industrial's operating costs, including a fixed amount for capital investment. The utility assumed the cost—about $9 per kilowatt of firm power—of making the necessary interconnection and of synchronizing the industrial station.

Priorities for the necessary material were obtained on a PD-200 project rating application which was sent to the project section of the power division, where it was supported by the allocations section administering L-94.

How to Get Fuse Replacements

Case No. 16

WPB's power division often gets inquiries from utilities asking how they can maintain "shelf stocks" of residential fuses to be carried by service men responding to customer calls.

Most utilities have been obtaining fuse supplies through Order P-46, assigning the rating of that order to their own requisitions upon suppliers. Fuses are not properly a repair and maintenance or operating supply under that order, but there has been no other priority procedure available and use of P-46 has been allowed.

A better procedure now is to apply for fuses on the PD-1X form set up by WPB's distributors branch for the express purpose of providing a means of maintaining a continuing stock of small items which are normally distributed singly or in small lots to ultimate consumers having no priority rating. Fuses can then be removed entirely from the P-46 inventory, withdrawal and delivery records.

℞ DON'T FILE a PD-1A form asking both for a rating with which to buy new materials and for authorization to withdraw materials from excess inventory. Use PD-1A forms only to obtain ratings for materials and equipment to be purchased. Authority to withdraw material from frozen inventory is obtained by writing a letter to the power division, marked: Attn P-46.

If the job involves both new and excess stocks materials file both the PD-1A and the letter applications, each covering only that portion of the material which is applicable. Write a letter outlining the whole story of what is to be done and why it is necessary, and attach copies both with the PD-1A and with the letter application. And mail the PD-1A and the P-46 application to Washington in *separate envelopes;* if this sounds senseless, just remember that WPB's mail room clerks handle thousands of letters daily and everything in an envelope with a PD-1A form gets stapled to the blank with robot precision.

New X-Ray Meter Aids Pole Inspection

New automatic exposure control, improved power supply, safety investigation eliminate former difficulties with X-ray pole inspection technique now used on semi-routine basis by Detroit company

MYRON ZUCKER, R. STOKER and L. H. SAMPSON, Detroit Edison Company, Detroit, Mich.

IMPROVED EQUIPMENT for inspecting poles by X-ray has had nearly a year's semi-routine trial on the Detroit Edison Company's distribution lines. The responsible departments feel that its practicability as a regular working tool has been established and anticipate extending its use as much as feasible. The most important addition to the process, described in a previous ELECTRICAL WORLD article,* is an instrument that insures radiographic images of the proper darkness for legibility. Also, a new caliper stand holds aluminum wedges shaped to make the X-ray image more uniform, and other accessories stabilize the operation of the gasoline motor-generator.

X-RAY EQUIPMENT at pole; at left is the ionization chamber—amplifier of the exposure meter; note aluminum wedges

X-ray Inspection

Our experience in X-ray inspection has been confined almost entirely to Northern cedars. Southern pines and Western cedars yield even better radiographs than do Northern cedars, but we have had so few cases of decay in treated poles that the problems of X-ray inspection have not been thoroughly explored. It is believed that X-ray will be especially valuable for treated poles since it does not weaken the protective seal of creosote as do other means of exploring.

If experience proves that Southern pines disintegrate high above ground, X-raying—and indeed present standard testing methods—will be impracticable.

The question of taking radiographs below ground is also important, since digging takes over half the time at each pole. Having found that in untreated Northern cedars the weakest section is usually about 4 in. below ground, we dig a hole large enough to center the film at this portion of the pole. For the species (Western cedars and Southern pines) with which we will be more concerned in the future there is some hope that digging will not be necessary.

While the cost of X-ray inspection is still not determined precisely, data are being collected on the major uncertainty—speed of operation. For a two-man crew in an area where digging was impeded by hard clay and gravel an average day's work included 87 poles, of which 20 were radiographed, 40 sounded and 27 visually inspected. Besides taking radiographs, the inspectors also noted all the other factors that so often govern pole replacement.

Automatic Control of Exposure

In selecting the radiographic exposure time the multiplicity of variables makes it impossible to develop any empirical guide for properly exposing film. An inexpensive device has now been developed to de-energize automatically the X-ray machine when the correct amount of X-radiation reaches the film. This automatic control (about to be manufactured by

*See "X-Ray Pole Inspection a New Engineering Tool," "Electrical World," March 23, 1940.

the Electronic Control Corporation of Detroit) has had about nine months' service on the truck and has proved rugged and reliable.

Component Parts

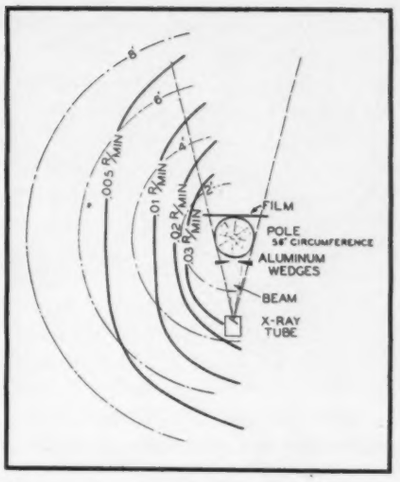
It consists of an air-ionization chamber, a sensitive single-tube amplifier with attendant batteries, a styrene grid condenser to obtain the integrating type of operation, a relay to discharge the condenser after the exposure and a relay to de-energize the X-ray generator. The circuit diagram is shown. A charge is accumulated on the condenser at a rate dependent on the conductivity of the ionization chamber, which in turn depends on the X-ray intensity at the ionization chamber. Voltage across the condenser controls the plate current of the amplifier tube that operates the relay for de-energizing the X-ray generator. In operation the inspector places the ionization chamber (which is directly connected to the amplifier) behind the film, pushes a button in the control box to discharge the condenser and energizes the X-ray machine by pressing the push-button switch. Exposure is stopped by the controller at the proper time, regardless of pole size or condition, variation in rate of X-ray production, or ambient conditions.

A variation of this meter has been used to indicate the X-ray intensity directly. Full details of this instrument have been published† elsewhere. Chief differences are that the condenser of the MeterR is replaced by a grid-resistor, and the relay which controls the X-ray generator is replaced by an output meter to indicate X-ray intensity.

Aluminum Wedges

Over-exposure of those portions of the radiograph where the rays traverse only a short section of wood which was formerly solved by placing a rubber girdle around the pole, is now met by interposing curved aluminum wedges supported on the caliper legs. These wedges keep the images of the thick and thin parts of the pole within the desirable limits of density. They are quickly adjusted to any pole regardless of size,

† See "The MeterX," A Portable Direct-Reading X-ray Intensity Meter," Myron Zucker and L. H. Sampson, *ASTM Bulletin*, August, 1941, pages 41-43.



LINES of equal dosage (of X-ray) show that the inverse square law holds approximately for secondary radiation; at distance of 25 ft. operator receives 1/40 of accepted permissible dosage

irregularities, or the presence of wires, rods, etc.

Knowing the relative X-ray absorptivity of aluminum as compared to wood, we can readily figure the shape of a wedge to fit any size pole. Calculations show that for a wide range of diameters it is possible to design one wedge which, with proper adjustment, may be used with any pole encountered.

For convenience, the guides upon which the wedges move transversely are fixed half-way between the X-ray machine and the film, and an arc of 8¾ in. radius was used for the wedge curve.

In the early stages the electrical power supply was unsatisfactory. First, poor power factor of the load caused excessive voltage regulation on the 1,500-watt gasoline motor-generator. This was reduced to a few percent by paralleling a 400-microfarad electrolytic condenser with the X-ray machine. Second trouble was cyclic variation of voltage because of "galloping" of the motor-generator set. This condition was corrected by automatically connecting a "dummy" load of about 1,200 watts (two small heating elements) when the main circuit of the X-ray machine is not in operation. (The tube filament is always energized.) Thus there is no great transient to induce oscillations and the generator operates very smoothly. These two improvements result in stable power supply, considering the overload on the power source.

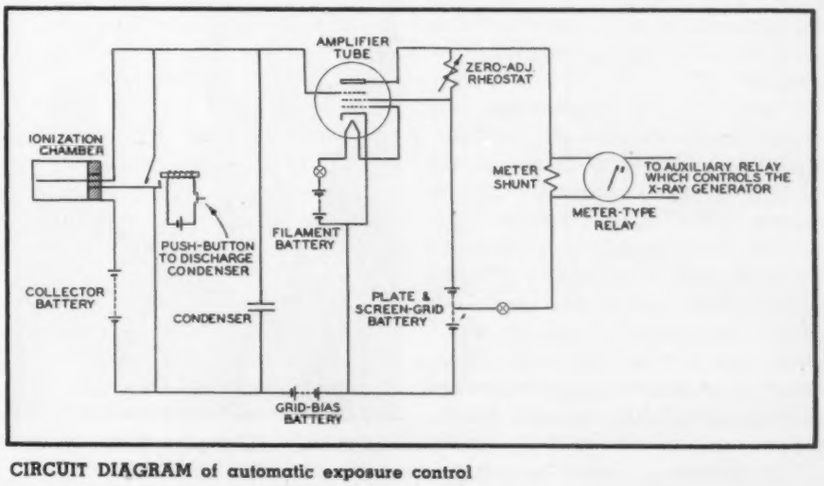
Diagnosis

Diagnosis is based primarily on growth ring lines, their presence indicating sound wood and their absence lack of strong wood. Graduation in density of the radiograph is of secondary importance, because the indications are obscured by variation in moisture content of the pole.

Dirt on the pole surface produces a mottled pattern on the film, similar to that representing decay. The two can be distinguished because dirt produces light spots, deterioration dark ones. Brushing the pole before exposure helps eliminate dirt.

Processing

With the automatic X-ray control assuring constant exposure of the film, we have been able to standardize processing: eight minutes for developing at 65 deg. ± 1 deg., one min-



CIRCUIT DIAGRAM of automatic exposure control

ute rinse, ten minutes fix and 30 minutes wash. About 50 radiographs per hour can be processed by one man.

Safety

Important in this new method of inspection is the X-ray operator's safety. Special study has been given to protection from X-ray burns. Small doses of these rays may cause irreparable damage to human tissues if continued over a long period. Exposure to the primary beam is not necessary to cause damage; there is enough radiation scattered by any object that direct rays strike to create a hazard. Inspectors must, therefore, be subjected to less than the "tolerance dose" recognized as non-injurious. "Secondary" radiation produced in X-raying poles is intense enough to be read on the previously mentioned X-ray instrument for some distance from the pole. It was used, therefore, to measure the X-ray field, and intensities were checked by the more common (but time-consuming) methods of exposing, both dental films and a Victoreen dosage meter. Broken lines of equal dosage indicate that the inverse-square law holds approximately for this secondary radiation.

Operators standing 25 ft. from the pole are exposed to only one-fortieth of the accepted permissible dose, which is, according to the National Bureau of Standards, 2/10 Roentgen per day. Thus, inspectors are assigned a low-density station from which to operate the X-ray equipment. Blood count and dental film checks are an added precaution.

The method has shown many advantages for special studies of pole life. If field studies now in progress show reasonable economy the X-ray pole inspection method will take its place as a routine test procedure.

Higher Circuit Capacity— Same Weight of Copper

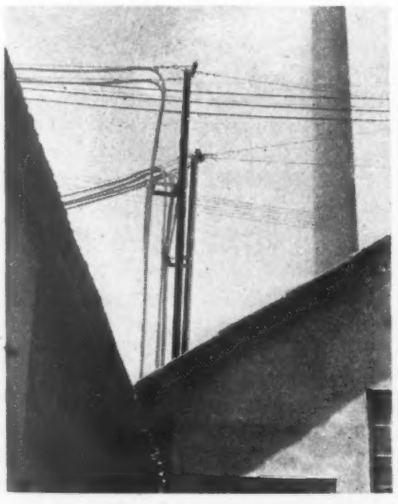
Modern low-reactance cable replacing more widely spaced conductors in open construction greatly reduces pressure drop in long 480-volt circuit

G. L. HODDY, General Electric Co., and THOMAS McDONALD, Louisville Cement Co.

VOLTAGE DROP of 38 percent reduced to 10 percent. That improvement was accomplished without increasing the weight of copper in the line, simply by a better application of it. Then by increasing the amount of copper one-third and adding some condenser capacity the drop was further reduced to 6.5 percent for a load about 12 percent higher than before.

These startling results were obtained in the revision of a 480-volt circuit in the plant of the Louisville Cement Company at Speed, Ind. The circuit, before revision, ran overhead 1,000 ft. and in conduit 150 ft. from the plant power house to a mill group. The overhead portion was comprised of two 700,000-cir.mil conductors per phase and the run in conduit had three conductors of the same size on each phase, a total of around 16,000 lb. of copper.

The mill group served by the circuit consists of two units, a preliminary process and a tube mill with induction motor connected loads of 596 and 910 hp. respectively, the latter including four 150-hp. motors. Up to 1939 it was necessary to run only one of the two operating units at a time. Under these conditions the circuit performed pretty well, although under maximum load of the larger unit the pressure would sometimes drop to 390 volts at the receiving end.



RISERS from side of power house show simplicity of cable construction

Then in 1939 the greatly increased amount of building construction in the country made enlarged demands on the cement industry. A change in production methods at this plant made it possible to operate the preliminary process and the tube mill at the same time and both operated continuously. Voltage readings showed the poor old circuit to be having a tough time. With motors totaling 700 hp. in use the pressure read 420 volts at the receiving end. Then as the four 150-hp. motors in the tube mill were started the readings dropped, successively, to 408, 382, 328 and 300 volts. Then when

a little more load was added the voltage dropped to 240 and the motors pulled out.

When the receiving end voltage was 300, the meters in the power house showed 1,050 kw., 2,420 amp. and 2,010 kva., while the load at the mill was 891 kw. at 71 percent power factor. Line loss was 159 kw., 18 percent. Obviously something had to be done, and quickly.

Any one or a combination of several things might have been done:

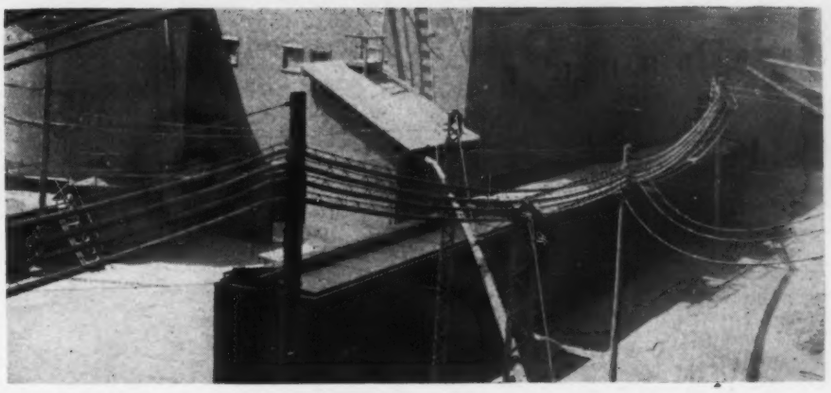
1. Reduce the reactive current by power-factor correction.
2. Neutralize circuit reactance by series capacitors.
3. Improve voltage by using a higher transmission voltage or by means of induction or step regulators.
4. Reduce circuit impedance by rearrangement of conductors, or by adding parallel lines.

Different Methods Analyzed

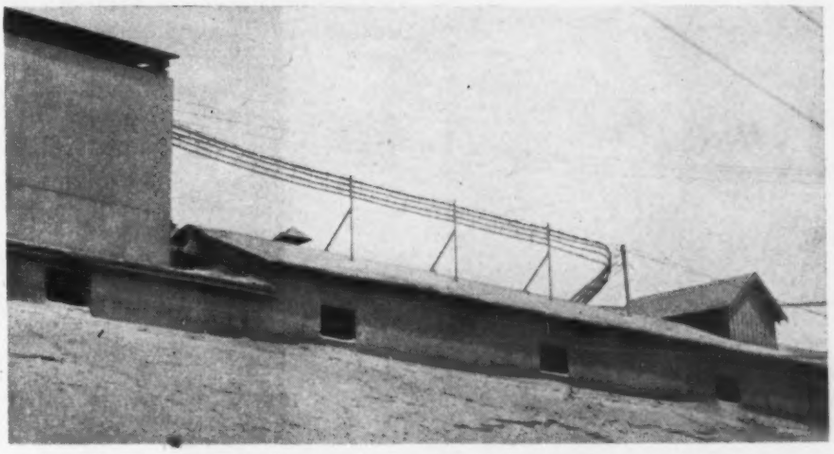
The different methods were analyzed from the standpoint of cost, time to secure apparatus and over-all operating economies. Calculation indicated that the desired results could be obtained at about the same cost for different ones of the several methods, but it appeared that replacement of the pole line with three 500,000-cir.mil interlocking armor, varnished cambric three-conductor cables could be accomp'ished in the shortest time and would offer opportunity for further expansion most easily. Because of the reduced spacing of the conductors in this three-conductor cable the circuit reactance was reduced 80 percent.

After the new lines were installed this mill load was connected. The voltage was 433 volts with 840 kw. at 71 percent power factor at the mill. The power plant meters showed 900 kw. and 1,260 kva. This amounted to a decrease of 74 percent in the voltage drop at the mill and a reduction of 750 kva. load on the power plant. The copper loss in the lines was reduced from 159 to 60 kw. All this was accomplished with practically no change in the amount of copper, the weight in the new line being approximately equal to that salvaged from the old.

Later it was found that the production process could be improved by the addition of air separation equipment. This required an addition of 280 hp. In order to handle this it was necessary to install another 500,000-cir.mil, three-conductor cable, and to add 360 kva. in shunt capacitors to reduce the load current. The capacitors were purchased in four 90-kva. units and each unit was permanently connected to each of the four 150-hp. motors so that they would be automatically switched with load.



CABLES are hung vertically on poles



RIGHT-ANGLE turn on a building roof

Load Readings Again Taken

After these changes were made load readings were again taken and with 1,000 kw. at 83 percent power factor at the mill a voltage drop of 31 volts was recorded on the circuit. The power plant meters showed 1,045 kw. and 1,260 kva.

A new route was selected for the cable line in order to make room for possible future plant expansion. This allowed the old line to be continued in service until the new installation was complete and afforded better protection and support. The finished length of the new line is 1,085 ft., 65 ft. shorter than the old. Maximum advantage was taken of existing buildings and structures for supports.

Each cable is supported, for its entire span length, on a ½-in., seven-strand, galvanized messenger. Galvanized cable rings are spaced about 24 in. apart. Cables are spliced about midway in the run at a point where they pass through a building. The splices are inclosed in sheet metal junction boxes. This made the task of splicing easy and provides a convenient method of testing. Connections are made at each end of the line by stripping back the armor, taping the ends and using standard terminals on each conductor.

The cost of the installation was:

4,360 ft. of 500,000-cir.mil, three-conductor armored cable	$ 8,899
Four 90-kva. capacitor units	2,766
Messenger wire, miscellaneous hardware	850
Labor	1,900
Total	$14,415

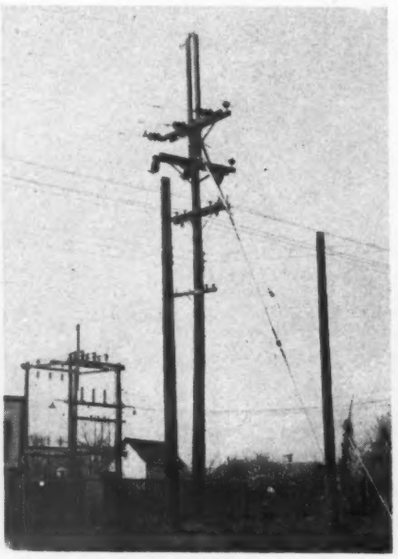
With the present load it is expected that the installation will be paid for in direct savings within four years.

BAYONETS CARRY SHIELD

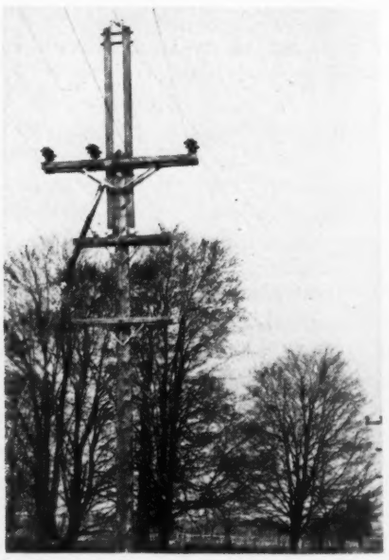
A. F. MAXWELL and F. C. HELWIG, Toledo Edison Company

IN ORDER to improve reliability of service on a section of 34.5-kv. transmission line which serves industrial plants engaged on war contracts an overhead ground wire has been installed. The wire is $\frac{5}{16}$-in. stranded Copperweld and it is installed to afford a 30-deg. angle of shielding to the power conductors. It is carried into the substations to give them further shielding and has been permanently grounded to the grounds of seven substations.

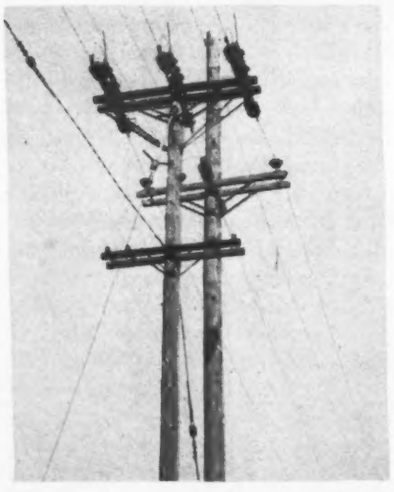
TALLER POLES installed in some instances on 34.5-kv. transmission line to carry overhead ground wire (5/16-in. Copperweld)



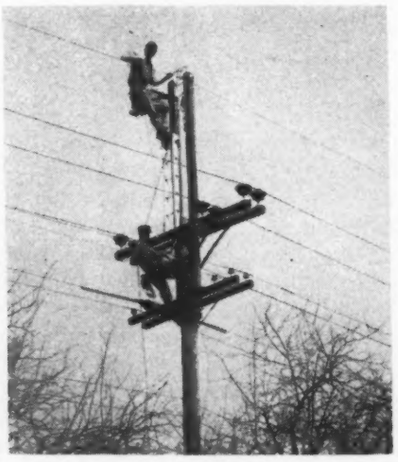
GROUND WIRE installation using Hughes A-699-B wood bayonet; ground wire looped into substation to connect to substation ground and to shield the substation



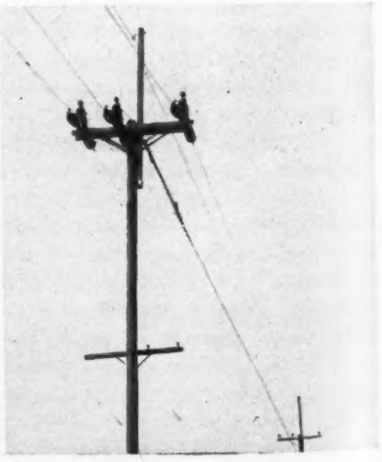
TYPICAL installation of Hughes A-699 and 699-B wood bayonets shows doubled spacer bolts at top



HIGHER POLE set to carry ground wire above pole-top switches left in place on existing pole; extensions used on adjacent poles



LADDER rigged to facilitate attachment of ground wire to wood bayonet; same rig used for installing the bayonets

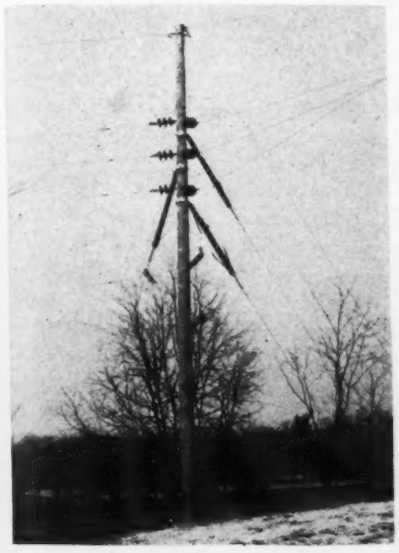


WOOD BAYONETS also used to carry overhead ground wire to shield pole top switches

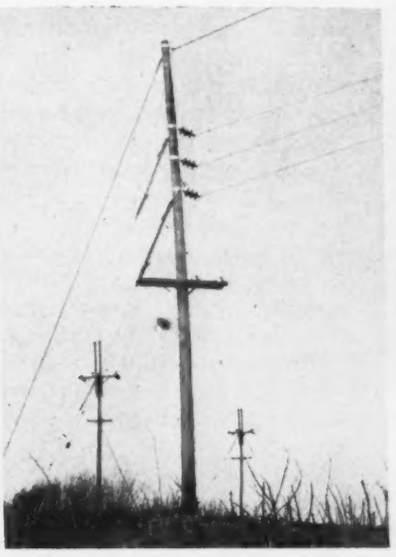
WIRE FOR LINE RELIABILITY

War-load 34-kv. line has a ground wire added — Wood bayonets installed — Wire extended to substation frames to shield them also

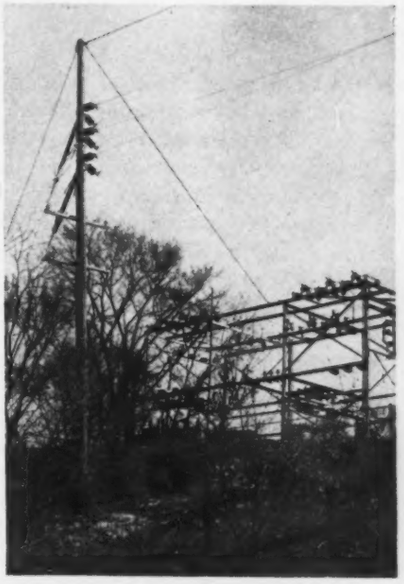
In general, the added ground wire is carried by single or double Hughes wood bayonets, but in some instances taller poles have been installed, either replacing insufficiently tall poles or adjacent to poles retained to carry pole-top switches. Accompanying pictures show the details of installation, including the guying at corners at which an uninsulated guy is provided to take the angle strain at the top of the pole or bayonet.



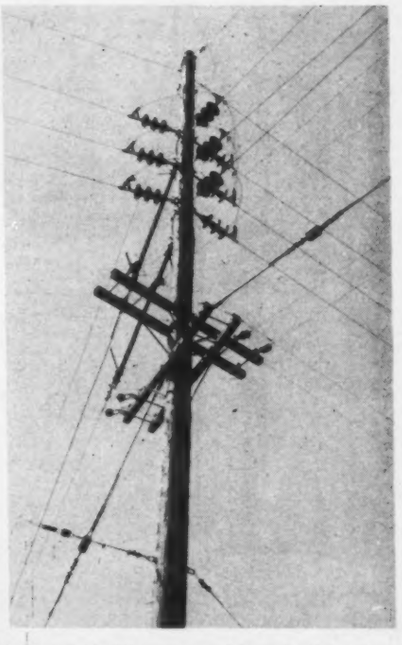
MULTIPLE GUYS with wood-strain insulators to take strain of severe corners; note uninsulated guy at ground wire position



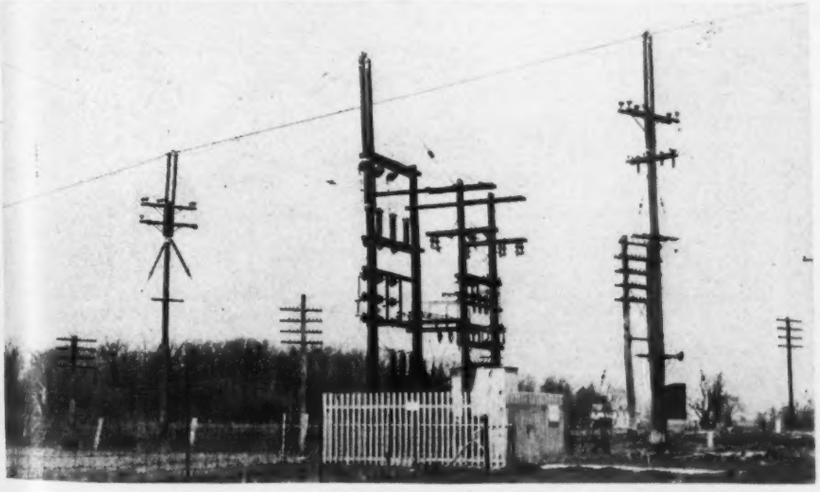
TYPICAL corner construction, with top-guyed pole; lesser angles adjacent used doubled bayonets



GROUND WIRE dead-ended at corner and grounded to substation frame



FOUR GUYS, two with wood strains, effect a heavy three-way corner construction



STATIC WIRE extended into substation from passing line to provide shielding

Past Experience Guides Second Topping Turbine Installation

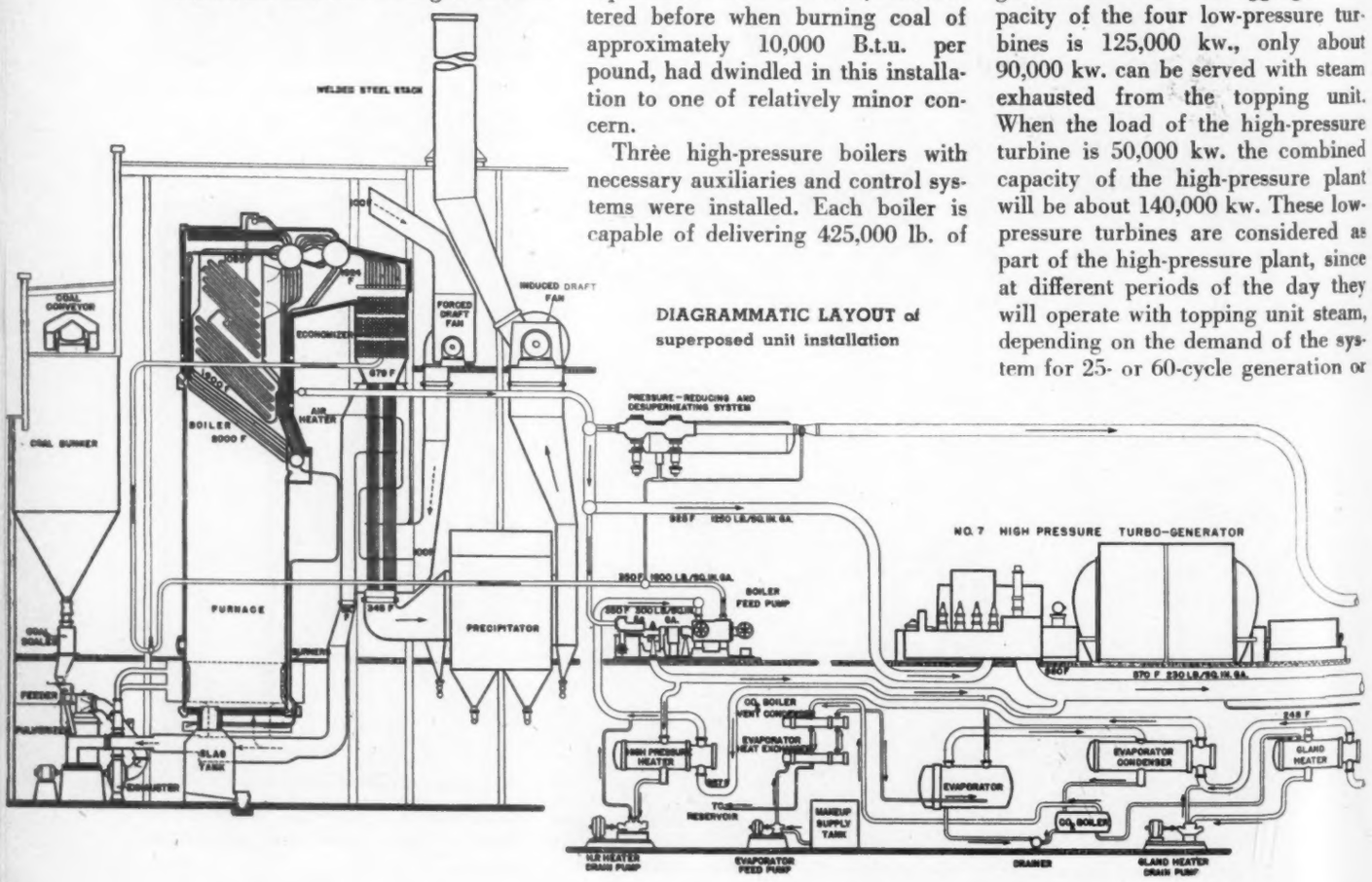
Utility selects superposition a second time for major station — Experience with first high-pressure topping unit guides latest addition — Boiler plant improved to eliminate operating difficulties

A LIMITED SUPPLY of condensing water and the economies offered by the replacement plan influenced the selection of a superposed rather than a condensing turbine for expanding an important generating station. This new 50,000-kw., hydrogen-cooled, high-pressure unit was the second topping machine to be installed on the particular system in five years.

Actual design features of the new unit were dictated to a considerable extent by experience gained with the initial unit and by existing features of the station where it was added. Particular attention was given to improvements in the boiler plant that would eliminate operating difficulties previously encountered. Wide spacing in tube banks and liberal furnace proportions with low heat release at maximum rating were provided to reduce former slagging difficulties. As a result of adequate and effective boiler water circulation and application of the method of feedwater treatment that had been found satisfactory in the first installation no tube failures have been encountered up to the present time. The major problem of combating slag fouling of boiler and superheater tube surfaces, encountered before when burning coal of approximately 10,000 B.t.u. per pound, had dwindled in this installation to one of relatively minor concern.

Three high-pressure boilers with necessary auxiliaries and control systems were installed. Each boiler is capable of delivering 425,000 lb. of steam per hour at 1,325 psi. and 935 F. These boilers serve a combined impulse and reaction type, single-cylinder turbine driving a 62,500-kva., 80 percent power factor, 3,600-r.p.m. hydrogen-cooled generator. The turbine operates with 1,250 psi., 925 F. steam at the throttle and exhausts at 230 psi., 580 F. to the low-pressure header system.

The topping turbine will normally operate in combination with three of four existing horizontal low-pressure condensing turbines, two of which are for 25-cycle and two for 60-cycle generation. While the aggregate capacity of the four low-pressure turbines is 125,000 kw., only about 90,000 kw. can be served with steam exhausted from the topping unit. When the load of the high-pressure turbine is 50,000 kw. the combined capacity of the high-pressure plant will be about 140,000 kw. These low-pressure turbines are considered as part of the high-pressure plant, since at different periods of the day they will operate with topping unit steam, depending on the demand of the system for 25- or 60-cycle generation or



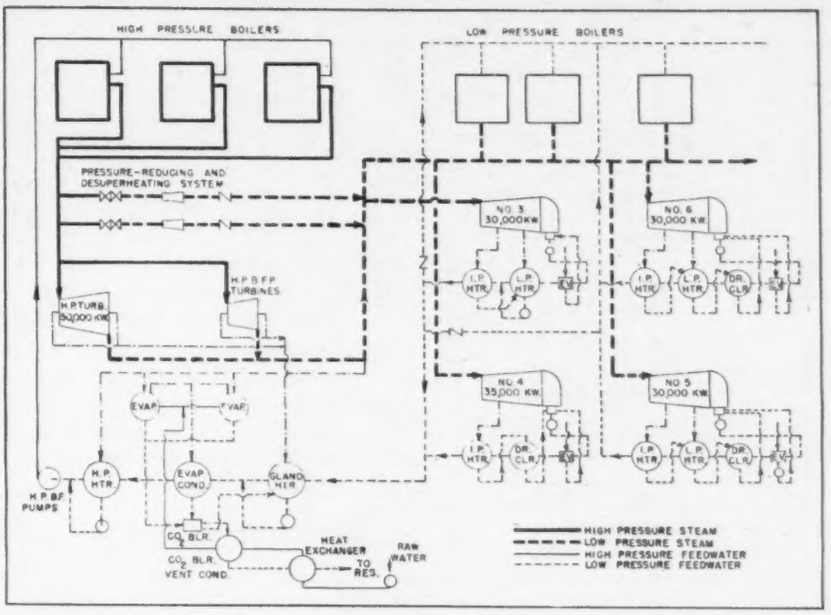
DIAGRAMMATIC LAYOUT of superposed unit installation

both. Full capacity of all low-pressure equipment, including that of two low-pressure vertical units, can be obtained if the remaining fifteen low-pressure boilers are operated.

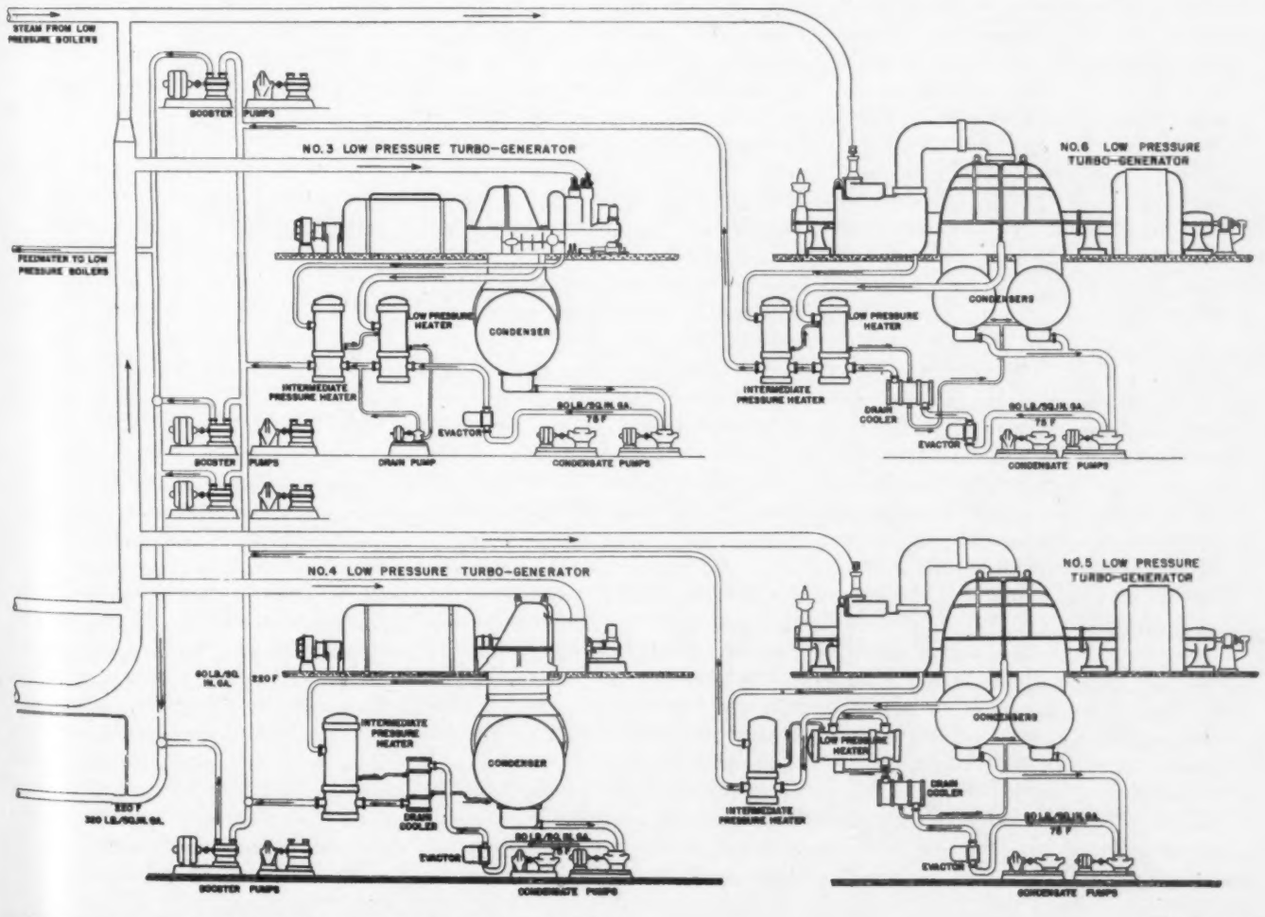
Pressure-Reducing Systems

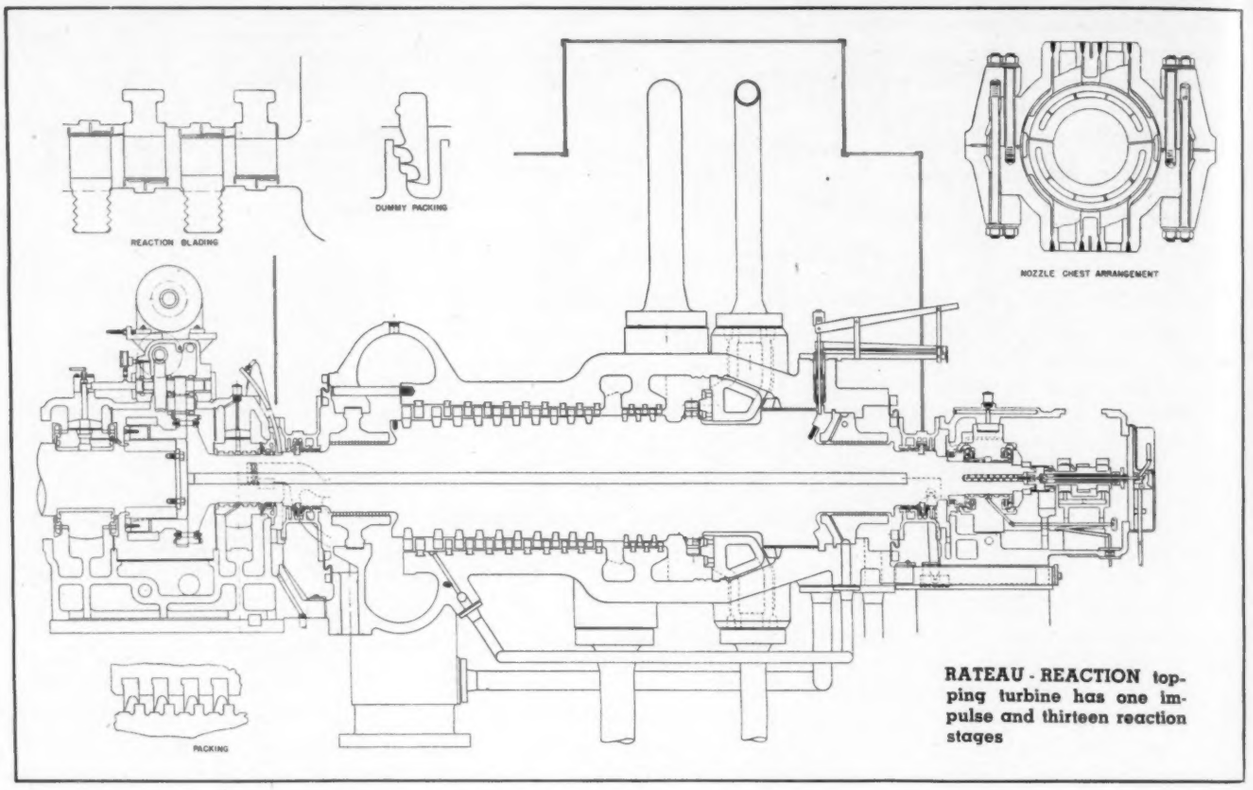
Pressure-reducing and desuperheating equipment is provided to permit continued operation of the low-pressure turbines with steam from the high-pressure boilers in the event of outage or trip-out of the topping turbine. Two sets are required because of valve size limitations in practical operation. Each set, capable of passing 700,000 lb. of high-pressure steam per hour, consists essentially of a quick opening and a regulating valve in series, followed by a desuperheating venturi, at the throat of which desuperheating water is injected. When the pressure in the low-pressure header reaches a predetermined low value this equipment automatically cuts in and steam supply to the low-pressure system is regulated. For use during periods when automatic control is not desired remote hand controls for positioning the regulating valves are provided.

All the horizontal low-pressure turbines operate on the regenerative cycle. Condensate from these turbines (see flow diagram) is pumped from condenser hotwells through steam jet air evacuator condensers, low-pressure and intermediate heaters to the suction of the booster pumps, not indicated on the diagram. These pumps, operating in parallel, discharge feedwater through the gland heater, evaporator condenser and high-pressure heater to the suction of the high-pressure boiler feed pumps which deliver the water through feedwater regula-



STEAM AND WATER flow diagram for topping unit and low-pressure machines





RATEAU - REACTION topping turbine has one impulse and thirteen reaction stages

tors to the economizers of the high-pressure boilers at approximately 350 deg. F. Under normal operating conditions the steam make-up of the high-pressure plant is evaporated raw water, with the exception of that portion representing condenser leakage. Raw water from the make-up supply tank, fed by city water, is pumped through an evaporator heat exchanger, a CO_2 boiler vent condenser and then is fed to the evaporators. Heat for evaporation is obtained from evaporator coils which are supplied with steam taken from the topping unit exhaust.

Heat Rate

The station heat rate in previous years of normal low-pressure operation was about 23,000 B.t.u. per net kw.-hr. The high-pressure addition will result in a performance of about 12,500 B.t.u. per net kw.-hr. with only high-pressure boilers in operation. At maximum station load, with low-pressure boilers also in service, it is estimated that the over-all station heat rate will be about 14,000 B.t.u. per net kw.-hr. Although no normal over-all performance values are yet available present indications are that predicted economy will be achieved.

Each steam-generating unit consists of a three-drum, bent tube boiler and water-cooled furnace. Design of these boilers is typical of the trend followed in the development of recent high-pressure steam generators. Particular attention was given to provisions for preventing slag fouling of boiler tube banks and superheater surfaces. In addition to the mechanical flue-blowing installation on each unit, facilities have been provided for hand lancing all boiler and superheater surfaces, very little of which has been necessary to date. Adequate and effective boiler water circulation was carefully studied. Particular stress was placed on the matter of solid-water downcomer supply and ample return - circulating - tube area. Provisions to secure single-circuit, positive circulation have proved adequate as no tube failures have occurred in the installation.

Operation to date has required few changes in the original installation. Some corrective measures were required, however, to secure the degree of superheat control necessary to satisfy requirements of the turbine manufacturer. Minor changes were required in the superheater gas by-pass damper arrangement to provide greater gas flow through the by-pass when operating at high capacities. It was also found that the slag covering the side wall tube surfaces would drop off when changing from the higher to lower boiler ratings. This caused greater heat absorption in the furnace and resulted in excessive changes in superheat. The application of slag hooks (tube studs) up to a certain coverage of the furnace wall area retained a normal slag coating at all boiler ratings and resulted in more uniform superheat control.

To secure desired superheat over a greater range of operating capacity the top set of burners on one boiler was replaced with burners of the tilting type. These are manipulated to direct the flame upward when the boilers are operated at lower ratings, the result being that proportionately less heat is absorbed by the furnace walls and more by the superheater. Tilting burners will be applied to all boilers as conditions permit.

Boiler Control

The combustion control system is designed to provide three methods of control: (1) full automatic control; (2) boiler manual control and (3) hand control. Under full automatic control the system is actuated by changes in the main steam header pressure through a master pressure element, controlling the regulators of all three boilers. Under boiler manual control, the regulators of any boiler may be controlled by a single manual control element. Under hand control the regulators of each boiler may be controlled individually from the

boiler board when desired. A superheater by-pass damper regulator for maintaining a constant steam temperature is controlled by a remote hand control unit only.

Fuel feed is controlled through regulators on the mill feeder and primary air by regulators operating exhauster inlet dampers. The total air flow is controlled by regulators which position control vanes on the induced-draft fans. Furnace draft is controlled automatically by regulators operating on impulses from the furnace pressure, which move control vanes in the forced-draft fan suctions. These regulators can also be controlled manually from the boiler boards. The boiler water level may be maintained automatically or regulated by hand from the boiler board. Efforts to attain simplicity in the control system have resulted in a design which has many advantages over the system used in the company's previous topping turbine installation.

Boiler Feed Pumps

Normally three boiler feed pumps are used when the three boilers are in service. Of the four high-pressure boiler feed pumps provided three are turbine driven and one is motor driven. Feed pump turbines take steam from the high-pressure steam supply and exhaust to the low-pressure header system in parallel with the topping turbine. The turbine-driven pumps are equipped with a feedwater differential control system that is designed to maintain an equal (or proportioned, if desired) flow of water through each turbine-driven pump and at the same time maintain a pressure differential between steam and feedwater pressure that is constant or that may be set to increase with increased boiler load. This is accomplished by automatically regulating the steam supply to the feed pump turbines. The motor-driven feed pump is hand controlled by throttling the pump discharge.

Topping turbine is of the Rateau-reaction type with one impulse and thirteen reaction stages. Because of the large amount of steam involved, the turbine is provided with two steam chests located one on each side of the turbine cylinder. On each steam chest is mounted a 14-in. throttle valve and four admission valves. An equalizing pipe is provided which connects the two steam chests at points directly after the throttle valves. Purpose of this pipe is to equalize the flow through both throttle valves at high loads. Turbine is designed for four valve points, a pair of valves controlling the steam flow for each valve point. It is equipped with both speed and back pressure governors.

The generator is a 50,000-kw., 80 percent power factor, three-phase, 60 cycle, 12,600-volt, 3,600 r.p.m., hydrogen-cooled unit. It is excited by means of an air-cooled exciter and pilot exciter driven from the main shaft through a 2:1 reduction gear which reduces the speed to 1,800 r.p.m. Generator is connected through reactors to the 12-kv., 60-cycle main buses.

Coal Handling

Coal for the high-pressure boilers is crushed to 1¼ in. size and delivered to the bunkers by bucket and belt conveyors. One 750-ton split discharge bunker is provided for each boiler. Coal from the bunkers passes through automatic coal scales to the feeders and mills. After pulverization, coal conveyed by primary air passes through the exhausters and is discharged into the furnace through two sets of tangential burners located, one above the other, in the lower corners of the furnace. Each of the two mills per boiler furnishes coal to one set of four burners.

The fuel used has a heat value of about 10,000 B.t.u. per pound with an ash content of about 14 percent. Coal is pulverized to a fineness such that 70 percent will pass through a 200-mesh screen. Electrical precipitators, one for each boiler, located in gas ducts between the air heater outlet and induced-draft fan inlet, remove 90 percent of the fly ash from the flue gas.

Fly ash collected in the precipitator hoppers is removed periodically by means of a conveyor system which discharges the ash into a storage tank, from where it is passed through a dustless unloader for disposal. Removal of the fly ash from all hoppers of one precipitator is made simultaneously. The flow of air in the conveyor system is induced by a positive displacement mechanical exhauster. A stand-by steam jet exhauster is provided for emergency.

Melted ash (furnace slag) flows continuously from the furnace walls through a water-cooled slag hole in the furnace floor into a water-filled slag tank located below each furnace, from where it is periodically sluiced to an outside ash pit for disposal.

List of Equipment

High-Pressure Turbo-Generator:

1 50,000-kw., 3,600-r.p.m. turbine
1,250 lb./sq.in., 925 F. throttle
230 lb./sq.in. exhaust
1 impulse—13 reaction stages
1 50,000-kw., 3,600-r.p.m. generator
12,600 volt, 3-phase, 60-cycle, 80% P.F., hydrogen cooled

High-Pressure Boilers:

3 425,000-lb./hr., 1,325 lb./sq.in. 935 F. steam generators
Effective Heating Surfaces:
Boiler, sq.ft. 10,550
Furnace, sq.ft. 6,815
Superheater, sq.ft. 22,884
Economizer, sq.ft. 12,262
Air heater, sq.ft. 62,725
Furnace volume, cu.ft. 24,250
Max. heat release, B.t.u./cu.ft./hr. 23,000
6 17.5-ton/hr. Raymond bowl mills

Fans:

3 240,000-c.f.m. turbovane induced-draft fans. Motors, 3 600-hp., 720-r.p.m.; 3 1,000-h.p., 900 r.p.m.
3 145,000-c.f.m. turbovane forced-draft fans. Motors, 3 250-hp., 900-r.p.m.; 3 500-hp., 1,200 r.p.m.

Electrical Precipitators:

3 75-kv., 36 gas duct, Cottrell precipitators
6 25-kva., 208 volt, 75-kv. transformers
6 Mechanical rectifiers

Boiler Feed Pumps:

3 500,000-lb./hr., 1,600-lb./sq.in., 350 F. pumps.
3 1,250-hp., 3,560-r.p.m., G.E. turbines
1 500,000-lb./hr., 1,600-lb./sq.in., 350 F. pump
1 1,500-hp., 3,560-r.p.m. Westinghouse constant-speed motor

Feedwater Heating, Evaporator Equipment:

1 2,230-sq.ft., 2-pass gland heater
1 1,408-sq.ft., 2-pass high-pressure heater
1 3,000-sq.ft., 2-pass evaporator condenser
2 25,000-lb./hr., 910-sq.ft. evaporators
1 101,600-lb./hr., 36-in. dia. CO_2 boiler
1 111-sq.ft., 2-pass CO_2 boiler vent condenser
1 75.5-sq.ft., single-pass evaporator heat exchanger

Pumps:

2 250-g.p.m., 345-lb./sq.in. high-pressure heater drain pumps
2 350-g.p.m., 345-lb./sq.in. gland heater drain pumps
2 150-g.p.m., 180-lb./sq.in. evaporator feed pumps

Pressure-Reducing and Desuperheating Equipment:

2 1,500-lb., 10-in. quick-opening valves
2 1,500-lb., 10-in. x 16-in., 700,000-lb./hr. pressure-reducing valves
2 400-lb., 16-in. x 18-in., Venturi type desuperheaters
2 400-lb., 18-ft. x 42-in. diameter water storage tanks

Conservation Keynotes Chicago Service Sales Policy

Threefold service program coordinated to preserve customer confidence in electric living — Door-to-door customer contact is supplemented by "victory home centers" and service advertising featuring "Mrs. Burton's adventures"

MINOR REPAIRS of appliances, cords and plugs are done on the spot by Commonwealth Edison customer contact men, who also diagnose major appliance failure and advise customer about repair

SERVICE, with conservation as its objective, is the keynote of the wartime sales policy of Chicago's Commonwealth Edison Company. It is the thread that runs through the company's new customer-service contact organization, its chain of "victory home centers" and its continuing customer advertising campaign. In all these activities the aim is conservation, conservation of existing appliances, conservation of civilian time and energy for war work and conservation of health through modern nutrition methods. Closely associated with this objective is the important task of preserving, of conserving, the customers' faith in electric living.

This job of sustaining the housewife's confidence and interest in electric appliances resolves itself into assuring for her the continued usefulness of the home appliances she already has, through better maintenance, prompt and efficient repair and guidance in their use.

To this end the Chicago company has organized nearly 60 key men in its merchandise sales force into a customer contact group to call on customers at intervals to consult with them on the use of electric service. These men, largely former merchandise crew supervisors, will form the core of a post-war merchandise sales organization. However, for the present, under the wartime service program, their principal function is to maintain direct contact between the customer and the company.

The merchandise sales force of the company has been reduced about 65 percent since curtailment of appliance manufacture went into effect. Of the 65 percent who have left the sales force nearly one-quarter are in the armed forces, one-half are in other industries and the balance have been transferred to other departments within the company. Of those remaining in the sales force a large portion are engaged in the customer service contact work.

In their scheduled calls on customers contact men are prepared to perform the following functions:

1. Make minor, on-the-spot, repairs of appliances, cords and plugs.
2. Diagnose major cases of appliance failure, advise the customer of the extent of damage and suggest nearby qualified repair agencies.
3. Give advice on care and use of appliances.
4. Note and report idle appliances and arrange for home service demonstrations.

Appliance Representative
Name.....

DAILY WORK REPORT

Date.....
Weather.....

NUMBER OF		INFORMATION (Cont'd)		APPLIANCES IN USE	NOT IN USE
Interviews		Advantages of		Ranges-----	
Satisfied Customers		Elec. Cookg.		Water Htr.	
Complaints		Victory Home Center		Refriger.-	
" Cleared		Home Laundry Clinic		Ironer----	
Sales				Radio-----	
" Dollars		Arranged calls for Home Service Representative		Washer----	
INFORMATION GIVEN ON				Vac. Cl.--	
		MADE MINOR REPAIRS:		Roaster---	
Government Bonds & Stamps		Iron- - - - - - - -		Dryer	
Branch Store Hours		Toaster - - - - - -			
C.E. Repair Service		Roaster - - - - - -		ATTITUDE TOWARD COMPANY	
Installation of		Lamps - - - - - - -		Favorable - - - - -	
Ranges		Cleaner - - - - - -		Unfavorable - - - -	
Water Heaters		Oiled		Neutral - - - - - -	
Lamp Renewal		Miscellaneous - - -			
Cust. Ord. Dept.		REPAIRS RECOMMENDED		REMARKS	
Home Service		CO-45 Slips sent in			
Bill Service					

DAILY customer contact reports are analyzed continuously for customer trends

5. Explain the company's lamp exchange policy, answer questions about bills, rates and service.
6. Invite customers to visit "victory home centers."
7. Sell whatever new appliances are still available.

Each customer service contact man is provided with a list of neighborhood dealers and appliance servicing agencies qualified and equipped to do appliance repair work. While the company does operate an appliance repair department, it prefers that dealers, particularly those handling specialized lines, do this work. The company hopes in this way to sustain a certain volume of floor traffic in dealers' stores during the present period of appliance curtailment.

Victory Home Centers

Second phase of the wartime service program is represented by the company's large downtown "victory home center" and ten smaller centers in its branch stores. Each such victory home center is in effect an educational forum that advises customers on (a) nutrition; (b) appliance maintenance, and (c) home laundry operation.

Purpose of these educational centers is to give the Chicago housewife a convenient place, near her home, where she can obtain accurate information and advice on various phases of electric appliance operation. They are manned by home economists and specialists familiar with the maintenance of refrigerators, lamps, motor-driven appliances and the like. Home service advisers in attendance give the customer-housewife suggestions on nutrition and economy meals, render marketing advice, explain how to plan and prepare meals so they will have a balanced vitamin content and retain food value in cooking. Popular with housewives is the information on storing different foods and on ways to prepare appealing dishes from left-overs. For the men a display on meat carving holds considerable attraction. Daily menus are displayed and distributed, while those who wish to go further than the discussion stage may attend the three-a-week victory cooking schools held in the company's downtown office building.

The appliance information section in the large downtown center features several booths where individual appliances are taken apart while the customer watches. Here operation is explained, the common misuses are pointed out and simple home treatment for the minor troubles demonstrated. When and where to oil, clean and adjust equipment is part of the demonstration. The customer carries away a booklet, "Wartime Care and Use of Electric Appliances," as a permanent home guide.

"VICTORY home centers," each with three sections, give housewives information on nutrition, appliance care, home laundry operation; three sections at the main store are shown

In the laundry section home service advisers demonstrate the proper use of laundry equipment. Such subjects as proper loading of the washer, how to wring clothes to save the ringer rolls and how to clean agitator are covered. Similar demonstrations are given in the use of electric ironers, but perhaps the most interesting to housewives is the demonstration on how to remove stains.

Third phase of the Chicago customer service program is a continuing service-type newspaper advertising campaign. Through it housewives who have not yet visited the victory home centers can follow the lessons learned by "Mrs. Burton," personifying the typical Chicago homemaker, as she learns about the care and use of her appliances from "Helen Scott," home service adviser. In these ads Mrs. Burton's friendly adventures in learning "How to make her washer last longer," "How to take care of her vacuum cleaner," "How to get the best service from her refrigerator," etc., are presented in cartoon style, with a summary box in each ad listing the points Mrs. Burton learned about care and use of her appliances. The series runs in Chicago's daily papers and in neighborhood and foreign language papers.

Editorials

S. B. WILLIAMS, *Editor*

Gas Competition for Government Business

TWO MONTHS AGO the Federal Public Housing Authority issued a release stating that electricity should not be used for war housing "in any area for space-heating or water-heating purposes. Electric energy should not be used for cooking unless there is no other practical solution; that is, gas, oil or coal should be substituted wherever practical to do so." The reason given for this release was a critical power situation in a large section of the country "according to the Power Branch estimates."

It is now stated by FPHA that the July 15 release did not refer to dormitories for war workers. Since that is about all that is now contemplated on a large scale the sting is gone.

Regardless of the material effect of the release, however, one thing is clear. The gas people are organized to fight electricity wherever government construction is involved. This summer it moved to Army camps when an official of the non-ferrous metals section, WPB, in reply to a letter from a gas-range manufacturer, stated:

"We agree that coal, wood and gas fire cooking equipment is more economical to strategic materials than electric cooking."

On the other hand, the Power Branch of WPB, according to Deputy Chief B. J. Sickler, has never taken a position that electricity should not be used for cooking in Army camps. "Our position," he said, "is that the method of cooking which uses the least over-all amount of materials should be used." This policy was confirmed last week by E. W. Roath, copper consultant in the conservation division, WPB.

In the case of gas or electricity the use of strategic material has to be considered from the standpoint of the appliance, its installation and the serving system.

An Army camp must have electricity for power and light. To add cooking does not mean a proportional increase in line or transformers because of the diversity. The figures show an exceedingly small additional material usage.

Most Army camps, however, are remote from gas generators and mains, so that the critical material requirements for gas would, it seems to us, be excessive.

Why does the electrical industry let the gas people get away with such things? Why hasn't the industry been more alert with these uninformed Washington agencies? The utilities won't fight for electricity because there are so many combination properties that feel they must favor the gas business wherever they can, but is there any reason why the manufacturers should not cooperatively present the facts?

The Customer's Stake In Progress

IN THE FOUR YEARS since fluorescent lamps came on the market, according to the annual I.E.S. progress report, the lamp renewal cost per lumen-hour has been reduced by more than 80 percent. This was brought about by seven price reductions, two general life increases and two increases in lumen ratings.

This is a remarkable record for so short a time, but it is only the beginning. Improvements are being made constantly in the tubes, accessories and reflectors, some in the regular course of research and some through necessity for materials conservation. While reductions from here on cannot be as spectacular percentage-wise, figured in terms of mounting output (40 million tubes this year), the aggregate savings will be large. This is the customer's stake in progress.

Street Lighting Units

WHY is street lighting alone sold on a candlepower rating instead of energy use? That question was raised by one of our subscribers and we put it to an authority in that field. The answer was that while other forms of lighting were rated in watts, street lighting was more of a contractual proposition involving not only energy but depreciation, maintenance, installation and other charges, the effort being to keep away from anything that might involve an argument.

That might be a good argument for contractual relations, but it does seem rather weak when speaking of lighting. In recent years there was an effort made to popularize the use of lumens. It made some headway for a while and then seemed to slow up.

There may be many reasons for this, but one seems to make sense. There are too many lumens. Can't we sell a man a 10-something lamp instead of a 10,000-lumen lamp? The term kilo-lumen has been suggested, but that sounds too formidable.

Candlepower is outmoded, and besides it doesn't tell the story anyway. Watts are of little value except when comparing the same kind of illuminants. Who has something else to suggest that doesn't sound like the national debt?

Dress Rehearsals for Outages

EVERYTHING feasible and practicable is designed into a power system to prevent the kinds of accidents that lead to major interruptions. Superhuman and quick-as-a-flash relays trip out the circuit interrupters and fuses do their part to confine the damage done by short circuits and fault currents. There are meter indications, tell-tales, signals, alarms and a host of automatic controls that give further indications of abnormal conditions before they can develop to destructive or even injurious magnitudes. There are test equipments and there is preventive maintenance to guard against any conceivable mishap. Still there are accidents.

Some plants may not have all of the aids to protection and continuity they could advantageously have in these days of output pressure. But even those that are well fortified with them face the risk of accidents that will not be due to sabotage, nor to carelessness, nor to incompetency. The best of mechanical contrivances will misfunction at times and this risk is increased each time the pattern of protection is enlarged by well-meant additions of supplementary devices. In other words, we must still in times of emergency depend upon human judgment and human ability to think and act quickly and properly.

Management, therefore, has a new problem of coordination confronting it if outages are to be lessened and power supply for war production kept continuous. It is a matter of coordination of the potentialities of competent operating staffs with the potentialities and shortcomings of automatic protective equipments. Automatic train control does not relieve the locomotive engineer of responsibility when things go amiss, nor has the steady injection of automatic devices in the power field relieved power operators of their manual and mental responsibilities.

If there is any executive who assumes that all is well because ample protectives and preventives have been applied he should ask himself what switch or valve he would close or open if things went wrong without warning and did not clear and what he could do manually to supersede automatics without making matters a thousand times worse. Then let him ask himself how he can expect the men at the plant to decide in a flick of an eyelid what he, the boss, would not dare decide after an hour's study of maps, diagrams and data.

This leads to the suggestion of dress rehearsals based on recommendations of an independent engineer who knows nothing of the local system but who does know why major outages have occurred elsewhere, largely because manpower did not know where to step in when mechanical safeguards were circumvented by obscure electrical happenings. Out of such education of operators would come a better understanding of the functions and limitations of protective equipment and a realization of the responsibility of the individual.

Something of this sort is going to be necessary if the power systems are to ride through the war loadings without numerous interruptions. The industry has done a superb job of providing adequate generating capacity. It is ahead of all others in providing ample fuel reserves. It is integrating regionally. It would be a shame if this fine record of preparedness was dulled by a succession of outages that might have been averted if more attention were given to the coordination of men and machines.

That 8½ Percent Difference

TWO NEGATIVES may make a positive, but two wrongs do not make a right. Nevertheless, we seem to have arrived at the right answer in our editorial in the last issue on the 8½ percent difference between book value and historic cost by the double error method, as many of our readers have pointed out to us.

The difference reported by 211 companies was 405 millions on a book valuation of 4¾ billions or 8½ percent. Obviously to accept the lower figure of valuation would not mean 8½ percent less gross but 8½ percent less return. This was the first error. The second was one of a misplaced decimal point. Apparently, however, these two errors came close to cancelling each other, for our original answer was a saving to the consumer of between 2 and 3 cents a month.

Three of our readers who drew our attention to the errors sent us their computations and each used a different approach, two of them agreeing on approximately nine-tenths of 1 percent reduction in the bill which for the residential customer would average a little under 3 cents a month.

We are also informed by the Federal Power Commission that the difference in values referred to were the utilities' own figures, while subsequent Commission audits increased this difference materially, over 30 percent, as of August this year, of reclassified electric plants of 64 companies. But even using these extreme figures we get a monthly saving in the average residential bill of only 10 cents.

As one of our readers, a consultant of long experience, stated, the effect on consumers of what constitutes the difference between starvation and plenty to the utilities is almost insignificant. So great is the investment in relation to gross that large variation in what is available for the investor is but a part of the amount which the consumer must pay.

Since there is too little to be gained by the user to justify this pressure to replace value with original cost we must look elsewhere for the reason. Can it be something that goes beyond mere rate regulation and dovetails with the SEC program, recently upheld in a Federal district court, to achieve wider distribution of voting control? A 30 percent reduction in value, while not affecting the consumer much, would be ruinous to most common stock equity and some preferred stock.

Washington Comment

GEORGE E. DOYING, Jr., Washington Correspondent

A New Concept of Rate Regulation

FOR practical purposes, utilities have all but lost their exemption from federal wartime price control which was written into the Price Control Act of last spring.

This is so whatever the outcome of the battle over inflation control legislation touched off by the President's Labor Day message to Congress.

The President has been told he has wartime powers to override legislation and few in Washington feel he would hesitate long if utility rates became (or were made) an important issue. Anyway, OPA already has undertaken, without effective rebuff, to become a general overseer of regulatory agencies considering increases in charges.

May Outlast War

With this loss of exemption from rate control is being born a new concept of utility rate regulation which appears quite likely to outlast the war. This concept involves segregation of taxes into those which can be counted as operating expenses, and thereby passed along to consumers in rates, and those which must be charged to investors. In this concept lies a vehicle by which the federal government can "standardize" rate regulation and utility returns.

At first, a few months ago, the only effort was to prevent utility rate increases which were sought solely as offsets to higher taxes. This was the expressed position of OPA in the case of a utility in Maine, which was withdrawn before coming to hearings, as well as in several other instances.

Now, however, definite exclusion of war taxes from operating expenses in fixing rates has been adopted as an over-all policy by the Federal Power Commission in its Panhandle Eastern Pipe Line Co. order. Said the FPC opinion:

"It is common knowledge that there will be increased tax burdens resulting from the requirements inherent in a global conflict. . . . Obviously, no one can expect to maintain a status or condition of business unaffected by the holocaust now sweeping the world. Increased tax burdens must be borne by the utility which enjoys a monopolistic position in the economic field, as well as by others which have no such advantage.

"So that there may be no confusion concerning the tax situation in connection with the companies subject to our jurisdiction, where necessary to stabilize utility rates at reasonable levels during the war emergency period, we propose to allow as proper operating expenses only such taxes as may be termed ordinary or normal. For the purpose of distinguishing between ordinary or normal and war emergency or abnormal taxes, we conclude that the basis prescribed in the 1940 Revenue Act establishes the highest possible level of federal taxes which may be allowed as an element of operating expense for such purpose."

FPC and OPA

The commission went on with an open bid to state regulatory agencies to line up behind its position with the further remark that "it is evident that Congress intended when it enacted the Emergency Price Control Act of 1942, that, during the prosecution of the present war, this commission, in carrying out its regulatory responsibilities, should make every reasonable effort to assist in making effective the national policy of price stabilization." Just what OPA has been saying all along of the responsibility of the state commissions.

By the wording of the commission's opinion, disallowance of war taxes in fixing rates is at present limited to instances "where necessary to stabilize utility rates at reasonable levels." But OPA now goes beyond that point!

In that agency's formal brief filed with the District of Columbia Public Utilities Commission last week in the Washington Gas Light Co. case, where a sliding-scale contract permits a rate rise, demand is made not only for exclusion of war taxes but also for revision of pre-war methods of computing depreciation and valuation and of pre-war policy regarding reasonable return "in the light of existing economic conditions and the federal government's program to stabilize the cost of living."

OPA's brief explains:

"A major war affects the whole economic structure of the nation. Proper exercise of the war power also may result in substantial changes in rights of property. . . . If the commission were to enter an order under this sliding scale arrangement, made in 1935, it would deny a fair hearing to the consumers and the action would be a plain abuse of the commission's discretion."

Thinking Not Universal

This amounts to considerably more than opposition to passing along war taxes on corporations to consumers. Oddly enough, application of the OPA philosophy probably would mean an order decreasing the gas rates which, despite its coincidence with the desires of social reformers, would normally be expected to run counter to another equally important cornerstone of the government's economic policy by creating additional unspendable purchasing power.

A few government officials who are quite sincere in their belief that wartime corporation taxes should be borne directly by capital feel OPA goes to excess in the Washington gas case. These officials hold the opinion that individuals should bear a share in the cost of war as citizens and that investors should pay, in addition, a direct price for protection of their property for preservation of their right to continue earning a return from that property. But they are willing to stop there!

Even granting this premise, however, doesn't quiet the conviction that once the precedents are established for government supervision of the economic structure of utility operations they will never be dropped.

NEWS OF THE WEEK

Court Affirms SEC Power Over Operating Companies

Federal district court, in decision on Jacksonville Gas case, holds commission has "virtually unlimited powers" in ordering reorganization to effect equitable distribution of voting power among security holders

The legal power of the Securities and Exchange Commission to authorize or order the reorganization of the corporate structure of an operating company, to effect equitable distribution of the voting power of the company's stock, has been affirmed by a federal district court. The commission, in a unanimous opinion handed down in June in the case of the Jacksonville Gas Co., claimed such power and set a precedent in the interpretation of Section 11 (b) (2)—the corporate simplification phase of the Holding Company Act (ELECTRICAL WORLD, June 6, page 5).

Court Interprets Sentence

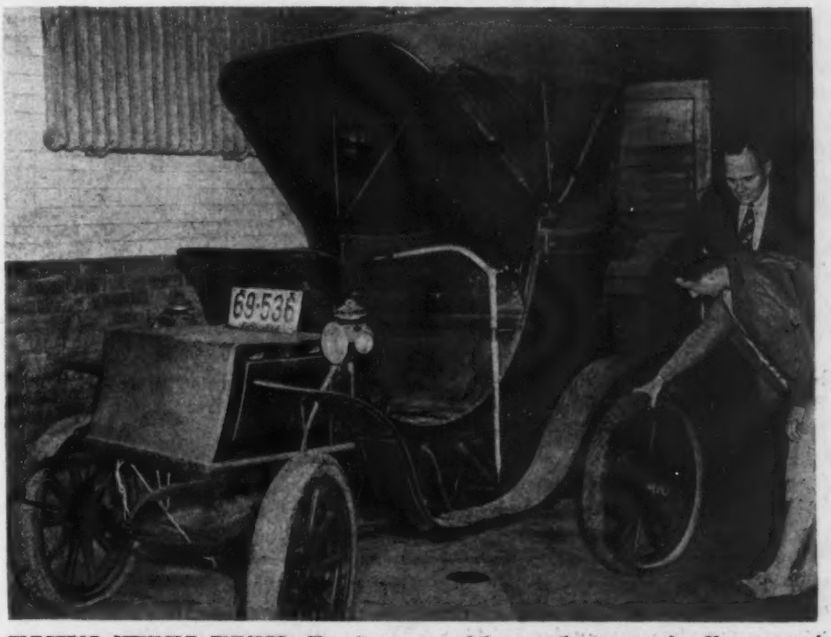
Major argument on the commission's power had centered upon interpretation of the last sentence of Section 11 (b) (2), which reads: "Except for the purpose of fairly and equitably distributing voting power among the security holders of such company, nothing in this paragraph shall authorize the commission to require any change in the corporate structure or existence of any company which is not a holding company, or of any company whose principal business is that of a public utility company."

Judge Louie W. Strum of the federal district court in Jacksonville, Fla., in his opinion on the Jacksonville Gas case, found that the commission had virtually unlimited powers under his interpretation of the sentence.

"When the act says that the commission is not authorized to require any change in the corporate structure of an operating utility, except for the purpose of fairly and equitably distributing voting power among the security holders of such company, it clearly implies that the commission may require such change if it be for that purpose," he held.

"Else why was the quoted exception included in the act? If Congress intended to withhold such power, that intent would have been evidenced beyond debate by simply omitting the quoted exception. Its inclusion in the act must be given appropriate significance and weight . . .

"The act contemplates that ordinarily the fair and equitable distribution of voting power in a holding company system may be accomplished by adjustments in the corporate structure of the holding companies themselves, rather than in the operating companies. But where, as here, intrinsic inequity in the distribution of voting power is found in the structure of the operating company, and the purpose of the proposed plan is to remedy that inequity, the above quoted language, when given its proper perspective in the whole act authorizes the commission to appropriately readjust the corporate structure of that particular operating utility, even



ELECTRIC VEHICLE ENLISTS—The first automobile contribution to the Newspapers' United Metal Scrap Drive at Hartford, Conn., was this electric runabout carrying a 1920 state license and given by the widow of the late Dr. George C. F. Williams of that city

though a comprehensive internal reorganization, affecting all classes of security holders, is necessary to accomplish that end."

Genesis of Test Case

Genesis of the particular case on which the important decision has been made came about with the filing of a voluntary plan on the part of the Jacksonville Gas Co., an operating subsidiary of American Gas & Power Co., for compliance with the act. The plan, to which the parent company was a willing party, called for the organization of a new company—Jacksonville Gas Corp.—which was to acquire the assets of the present company and issue to the present company all of its securities. The parent company, American Gas, which now owns 50 percent of Jacksonville Gas' single class of common stock, would be eliminated as the holding company and the other 50 percent of the capital stock of Jacksonville Gas would be cancelled.

The basis of reorganization was the capitalization of earning power upon which the commission relied for its ultimate determination of value. Adopting $210,000 as prospective gross annual income of the new company, before taxes, the commission reached a valuation of $2,625,000, based on an 8 percent capitalization of this income. The company's total long-term debt as of December 31, 1941, was $5,498,231 and its total capitalization and book surplus was $6,161,557. Since the total claim of the bondholders as of May 31, 1942, was $4,007,713, or far more than the SEC's estimate of the real value of the property, the court ruled that "the present capital stock obviously has no equity in the company." The holders of the stock, however, the court said, exercise the entire voting power—an obvious inequity within the meaning of Section 11 (b) (2) of the the act. The voting power, the court said, should be vested in the creditors, who are now the real owners.

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Work is Rushed on Units Transferred from Shasta

Striving to have the units in operation before the end of the year, Bureau of Reclamation workers are making rapid progress with the assembly of two 75,000-kw. generators which were transferred to Grand Coulee Dam from the Shasta Dam of the Central Valley project in California.

The first of the stators was completed several weeks ago and the second was completed this week. The first of the rotors is complete, except for finishing touches, and the assembly of the second is progressing rapidly.

Passing on War Taxes to Customers Denied by FPC

Commission refuses to recognize, for rate-making purposes, any tax increase after 1940; rules out "reproduction cost" evidence in fixing base rates in Panhandle gas case

Increased federal wartime taxes may not be passed on to consumers in the form of higher rates, the Federal Power Commission ruled last week. The commission's order was laid down in an order and decision requiring the Panhandle Eastern Pipe Line Co. and affiliates to make a reduction of $5,094,384 annually in rates for natural gas. The commission's order came during Congressional consideration of an anti-inflation bill, to which Senator Norris of Nebraska has proposed an amendment freezing public utility rates at September 15 levels (ELECTRICAL WORLD, September 19, page 71).

Reproduction Cost Disallowed

Crux of the new FPC policy is the refusal of the commission to recognize for rate-making purposes any tax increases after 1940. Rate increases designed to restore a utility's net income, after taxes, to its 1940 level will not be permitted, the commission said. Nor will they recognize post-1940 excise taxes imposed on utility sales of electricity or gas. A second feature of the latest FPC order was its exclusion of all evidence of reproduction cost in fixing base rates. Following the line of the Supreme Court decision in the case of the FPC vs. the Natural Gas Pipeline Co., in which the court decided that a regulatory commission could decide what theory to follow in fixing a rate base, the commission declared that "any thought that reproduction cost evidence is any longer required in the rate-making process is substantially destroyed."

In its warning on passing on tax increases to the consumer, the FPC decision said: "A utility should not be permitted to thwart the purpose and spirit of war price control legislation and the revenue laws by passing abnormal tax requirements along to its customers as an operating expense to be collected in increased rates. To allow such a procedure would in effect impose a sales tax upon consumers.

"So that there may be no confusion concerning the tax situation in connection with the companies subject to our jurisdiction, where necessary to stabilize utility rates at reasonable levels during the war emergency period, we propose to allow as proper operating expenses only such taxes as may be termed ordinary or normal. For the purpose of distinguishing between ordinary or normal and war emergency or abnormal taxes, we conclude that the basis prescribed in the 1940 Revenue Act establishes the highest possible level of federal taxes which may be allowed as an element of operating expense for such purpose. The 1941 Revenue Act and the pending 1942 proposal certainly reflect abnormal tax requirements for war purposes.

"Moreover, it is evident that Congress intended, when it enacted the Emergency Price Control Act of 1942, that during the prosecution of the present war, this commission, in carrying out its regulatory responsibilities, should make every reasonable effort to assist in making effective the national policy of price stabilization. In this regard we will be alert to the necessity for checking unwarranted increases in utility rates which, if permitted, will contribute to the disruptive inflationary process now threatening to destroy our economy."

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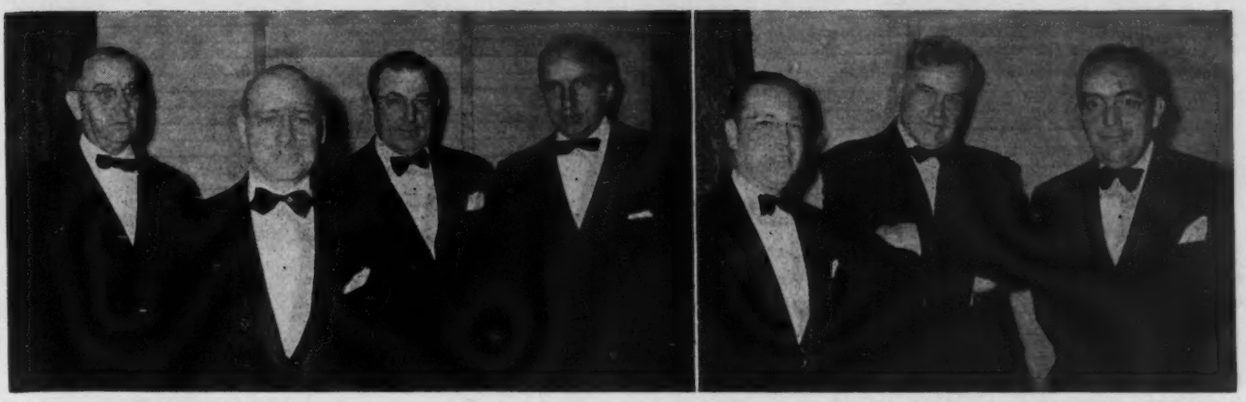
Jacksonville Seeks Two New Boilers

Burns & Roe, Inc., consulting engineers, who recently completed a survey of the municipal electric plant at Jacksonville, Fla., have been authorized to prepare plans and specifications for the installation of two new boilers at the Talleyrand Avenue generating plant so that these plans may be presented to WPB in Washington.

City Commissioner George A. Pierce, who directs the operations of the city's utilities, stated at a recent meeting of the City Commission that additional boiler capacity be provided for the generating plant, in order that full advantage might be taken of the present capacity. With the boilers now in operation the plant can produce only about 50,000 kw., an amount barely sufficient to furnish the needs of the present consumers, according to Commissioner Pierce, without taking into consideration new demands which may be made upon the local plant by war plants or other essential operations.

Through the two new boilers, which will cost approximately $1,100,000, 21,000 kw. will be added to capacity.



ATTEND CONVENTION—(L. to R.): E. A. Lewis, president Indiana-Michigan Electric Co.; H. T. Pritchard, president Indianapolis Power & Light Co.; R. A. Gallagher, president Public Service Co. of Indiana, Inc.; John Nuveen, Conservation Division, WPB, Chicago. At right are utility association officers—Flanking banquet speaker, Dr. M. S. Rice of Detroit (left and right), are Dean H. Mitchell, incoming president Indiana Electric Association, and W. Marshall Dale, retiring association president. Mitchell is president of Northern Indiana Public Service Co. and Dale is president of Indiana Service Corp.

War and Post-war Problems Probed at Indiana Meeting

Utilities seen as logical coordinators of community post-war planning — Public relations, safety, salvage and other questions occupy Indiana Electric Association

A foreshortened, wartime convention, carefully keyed to the tempo and problems of the times, drew several hundred Indiana utility men to Indianapolis last week for the annual gathering of the Indiana Electric Association. In three meaty sessions delegates heard national authorities speak on such subjects as post-war planning, industrial relations, steam engineering, home service in wartime, safety and salvage.

Stuart M. Crocker, executive vice-president General Electric Co., urged utilities to accept their responsibilities as the logical coordinators of post-war planning in their communities and to take steps now to make the transition from war to peacetime production smooth and free from the jolts of labor displacement. Crocker predicted that two years after ultimate victory 57,000,000 people will be gainfully employed in the United States, producing $110,000,000,000 of goods annually.

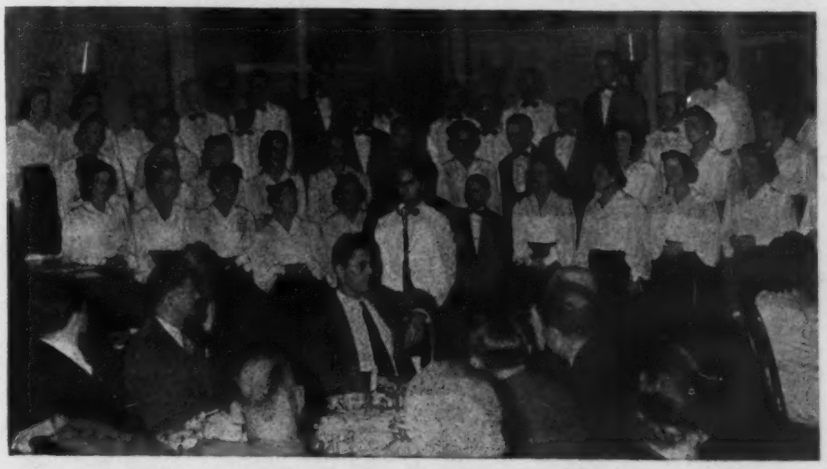
Public Relations Discussed

In an absentee paper on industrial and public relations, Ray Warren of the National Association of Manufacturers told delegates that at last business has come to realize that silence under attack is a foolish public relations policy. It leads public opinion to accept charges as truth. Business is no longer private, Warren asserted. It is a public matter. The rights and privileges of business ownership, therefore, rest in public opinion. If this is not recognized, he warned, private enterprise is through. Self-interest is drawing its own destruction.

Prof. H. L. Solberg, Purdue University, discussing modern steam engineering, asserted that there is more to be gained today by going to higher steam temperatures than to higher steam pressures. He questioned the advisability of using steam pressures so high that it becomes necessary to reheat steam at an intermediate pressure to get rid of entrained moisture. He approved the trend to larger boilers as a means of reducing the cost of stations and improving efficiency. "There is more justification," he asserted, "for three turbines to one boiler than there was for three boilers to one turbine." Today's problem in steam engineering is to operate superheaters to the temperature limit of the metal while at the same time keeping away from slagging of tubes, he declared.

"Now is the time to go into the home and show Mrs. Smith how to get the service from her appliances that she was promised when she bought them," declared Fern Snider, home service supervisor of the Georgia Power Company, in discussing home service in war time. She advocated continued emphasis on kitchen planning and home lighting, through home service.

With the security of the nation depending more than ever on the safety of the individual, George Opp, safety director of Detroit Edison, called for intensification of safety activities as a means of preserving needed manpower. Of the 100,000 lives that will be lost in accidents in 1942, he pointed out that



IPALCO CHORUS—Popular mixed chorus of Indianapolis Power & Light Co. entertained at the Thursday evening banquet of the Indiana utility group with a selection of popular and light classical music

90 percent are preventable. He urged utilities and other industries to make surveys, get in ahead of accidents and prevent them by the free exercise of common sense.

Better than half of the 17,000,000 tons of scrap that will be needed in the last six months of 1942 must come from industry, John Nuveen, WPB conservation division, Chicago, told the convention. He asked that careful plant surveys be made to uncover every possible pound of scrap metal.

Other convention speakers included Fred W. Bush, Allis-Chalmers Manufacturing Co.; H. G. Smith, Edison G. E. Appliance Co.; F. A. Fletcher, FBI, and G. A. Payton, Westinghouse.

Officers of the Indiana Electric Association elected for the coming year were: President, Dean Mitchell, president Northern Indiana Public Service Company; vice-president, L. B. Schiesz, vice-president Public Service Company of Indiana, Ind.; secretary-treasurer, R. E. Blossom, Indianapolis. Retiring president was W. Marshall Dale, president Indiana Service Corporation.

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New P-46 Order Expected Soon

Valle Succeeds Kells as P-46 Administrator — Fluorescent Order Extended

Paul Valle, formerly with the Rural Electrification Administration, has succeeded Charles F. Kells as administrator of the utility repair and maintenance priority order P-46. Mr. Valle has been assistant administrator for some time and has been handling emergency breakdown priority matters.

The new, and considerably revised, P-46 order to be in effect for the fourth quarter of 1942 was receiving final clearances within WPB this week for early issuance. It is expected that ratings will be increased in line with the materials situation, but that the volume of inventory and use of materials heretofore permitted under Section F will be reduced. P-46, as revised last June, expired September 30, but its life was extended for the period until the new version is finally issued.

The retiring P-46 administrator, after a brief period back at his desk with West Penn Power Co., is expected to return to the power division to work in the production section headed by J. E. Moore.

WPB also this week issued a second extension of the fluorescent limitation order pending final clearance of a revised order expected within a week or two. The order originally expired September 1.

More and Harder Work for Southeastern Engineers

Growing importance of Southeast in war production and in building up armed forces increases loads on systems and responsibilities of operators, S.E.E. meeting told

Commendation for what they have accomplished and promises that the future offers them plenty of opportunity to earn more of it under harder conditions were generously handed out to engineers of the Southeastern Electric Exchange at their section meeting in Atlanta last week. A large part of the commendation came from C. W. Mayott, chief of WPB's power branch pooling unit, who said that the success in meeting the energy shortage in the region last year resulted from the whole-hearted cooperation of utility operators and that the experience of that time has been an invaluable guide in setting the pattern of action to be taken in other regions where shortages may occur.

Although new capacity totaling over 1,500,000 kw. has been installed or scheduled for the Southeast since October, 1941, it may not be assumed that all difficulties are over, said Mr. Mayott. New loads including camps, munitions and other war production, as well as increased metal outputs, will increase power system burdens. At the same time, difficulties or impossibilities in obtaining materials and supplies, coupled with the problems of taking units out of service for necessary inspection and maintenance, will greatly complicate and make much harder the job of the utility operator. In effect, the word of the WPB to the Southeastern engineers, as apparent from Mr. Mayott's talk, was that having done much they must now do more.

Transformer Temperatures

The conservation of critical materials in the construction and the use of power transformers depends upon the reduction of transformer temperatures or, rather, upon the prevention of their rise, stated J. K. Hodnette, Westinghouse, and, of methods of cooling incorporated in design, that of forced oil circulation offers most promise. Advising caution in emergency loadings of transformers and other equipment, D. M. Jones, General Electric, said there is no way of telling what the effects may be on the life and future behavior of equipments thus burdened. Two considerations of equipment and system design were held up by Mr. Jones as of utmost importance in conservation, one the use of maximum practicable voltage in any given case and the other the supply of wattless current as close as possible to the points of requirement.

Safety Considerations

Conditions of war urgency must not be used to excuse neglect of safety, said W. B. Wright, Eastern Shore Public Service, pointing out that while death and injury by enemy attack must be accepted as part of war, there can be no acceptance of them as a necessary part of the daily work of men.

Presenting 56 specific instances as a partial list of substitutions of materials and changes in practice to meet wartime conditions, L. M. Smith, Alabama Power, said he expected such expedients, some of which may turn out to be improvements, to grow in number as the pressure of war forces utility engineers to turn to irregular and unconventional solutions for construction and operating problems. How New Orleans Public Service salvages and reuses materials and equipment was described by C. N. Dowling, with particular emphasis on the methods used to enlist the cooperation of all employees in the effort.

The role of the system operator in organizing and coordinating the flow of electricity to war purposes was detailed by Ray Conwell, Georgia Power. Because of their devotion to the ideal of high service quality ingrained in them by years of effort toward it, it will be more difficult to sell lower standards of service to utility people than to utility customers, asserted J. S. Bourne and J. C. Richert, Jr., Carolina Power & Light, in their paper on the changes in standards of service caused by scarcity of materials. One of the most interesting features of the meeting was the description by W. L. Rush, Louisiana Power & Light, and G. L. Rhodes, New Orleans Public Service, of the building of a 110-kv. transmission line from Gulfport to New Orleans across Lake Ponchartrain.

Speaker at a luncheon during the meeting, W. E. Mitchell, vice-president and general manager, Georgia Power, told the engineers that the war is only accelerating the pace of change, which is continuous and natural. The faster pace calls for open minds, for ability to think and to work in ways different from before, he said.

United Corp. Dissolution Held Necessary by SEC

Public utilities division of commission says one-stock recapitalization plan is only partial solution and urges liquidation of holding company

In a brief filed by the public utilities division, dissolution of the United Corp. as the only method of meeting the provisions of Section 11 (b) (2) of the Holding Company Act was recommended to the Securities and Exchange Commission last week. A voluntary plan submitted by the holding company, as a means of complying with the "death sentence," was dismissed by the commission as "elusive and fragmentary." Under the United plan, divestment of control over its subsidiaries, by reducing the amount of its holdings in excess of 10 percent of the voting securities in each subsidiary, had been proposed, the company, in the meantime, refraining from the right to vote such securities except with the approval of the commission.

United Corp. Replies

Taking sharp issue with the viewpoint of the commission's public utilities division, United Corp. replied in a brief filed with the commission that the SEC has "no power under the facts" to order dissolution of the corporation. United contended that the corporate structure of the company justified more than a single class of stock and denied that its existence "unduly and unnecessarily" complicated the holding company system of which it was a part. SEC counsel had held that a one-stock reorganization of United would be a partial solution to the problem by effecting equitable distribution of voting power among United's own security holders and remove the undue complexity of its corporate structure.

"Dissolution," the SEC division said, "makes it unnecessary to effect a one-stock reorganization of United, which would otherwise be necessary in order equitably to distribute voting power among its own security holders. Dissolution will permit the distribution among the security holders of United, in accordance with their equity, of its assets which have a value on the basis of market prices substantially in excess of the current market value of the outstanding securities of United.

"In such distribution the preferred- and common-stock holders will participate in accordance with their respective equities, unless it shall appear that there is no equity for the common stock, in which event, of course, the common stock will not participate in the distribution. Neither divestment of control without divestment of ownership, nor divestment of ownership of the respondent's holdings in the voting securities of its subsidiaries appears to be feasible or consistent with the interests of United's security holders."

Subsidiaries directly under the control of United, the division said, have a consolidated capitalization of $2,375,000,000 and indirect holdings give the holding company effective control over a total group of companies with a capitalization of more than $5,000,000,000. The subsidiaries of the $160,928,659 United Corp. with the percentage of total voting stock in each are given by the division as follows: Columbia Gas & Electric Corp., common stock 19.6 percent; Niagara Hudson Power Corp., common stock 23.2 percent; Public Service Corp. of New Jersey, common stock 13.9 percent, and United Gas Improvement Co., common stock, 26.1 percent. Other important common-stock holdings of United include 203,900 shares of Consolidated Edison, 1,798,270 shares of Commonwealth & Southern, 33,175 shares of Consolidated Gas, Electric Light & Power (Baltimore), and 63,002 shares of American Water Works & Electric.

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Power-Line Rights Asked in Westchester Deal

Negotiations for the sale by Westchester County of 140 acres of park and parkway lands as right-of-way for the new power line that will carry surplus electricity from New York City to upstate armament plants have been announced by Herbert C. Gerlach, County Executive.

Officials of the Westchester Lighting Co., serving as agent for the Niagara Hudson Power Co. and the Consolidated Edison Co., have offered $186,000 for the property, while the county has asked $299,000, Mr. Gerlach stated. A compromise at $240,000 virtually has been agreed upon, he added.

PENNSYLVANIA ELECTRIC ASSOCIATION MEETS—A one-day meeting in Philadelphia September 18 took the place this year of the annual convention of the Pennsylvania Electric Association. Members and guests are shown above at the banquet

Submit Cooking Data on Army Camps

Bonneville Study Quoted to Reverse Service Ban

A detailed presentation showing that electric cooking requires less critical materials, less fuel and therefore less transportation than other forms of cooking has been presented to the Army and other government war agencies in an effort to induce the War Department to reverse its recent ban on cooking electrically in new military posts.

The analysis was prepared by the Edison General Electric Appliance Co., Inc. It has been submitted to WPB Chairman Donald Nelson, Lieut.-Gen. Brehon Somervell, chief of the Army's Services of Supply; Transportation Director Joseph Eastman, and others.

Chief exhibit is an independent study made by the Bonneville Power Administration showing that, on the basis of an actual army camp experience, electric cooking improves load factor within the demand factor which the Army has specified for sizing electrical facilities.

Calculated for a 35,000-man camp, the study shows that 1.840 kw.-hr. is required per man per day for lighting and power, 0.845 kw.-hr. more for cooking, nearly 50 percent. Because of diversity, however, peak load—which shifts from afternoon to morning—is increased only a little more than one-fifth, and the over-all load factor is improved from 63.5 percent to 75 percent.

Pre-war published data showed that the Army designed its camp distribution systems for a 60 percent demand factor, yet in the Bonneville study the demand factor is 40.9 percent for lighting and power, 24.2 percent after addition of cooking. Completely aside from the question of cooking, this phase of the study indicates a possible saving in materials in laying out distribution systems.

Other exhibits in the company presentation show that nearly ten times as much coal is required for coal cooking as for electric, and that electrical appliances require only one-half as much critical metal as gas and one-third as much as oil.

The presentation was prepared as a direct result of a letter written by a WPB Conservation Division official last summer stating that "we agree that coal, wood and gas fire cooking equipment is more economical to strategic materials than electric cooking." It was as an outgrowth of this statement that the Army closed the door to electric cooking in future camp construction.

WPB's Conservation Division since, however, has retracted the early statement—after looking into the facts. Its position now, as enunciated by E. W. Roath, copper consultant, is that "we want to see the method of cooking used, for military use, which will require the least amount of critical materials for the particular application involved." This also is the position of the WPB power division.

MEETINGS

American Society of Civil Engineers—Fall meeting, General Brock Hotel, Niagara Falls, Ont., Canada, October 14-15; annual meeting, headquarters, New York, N. Y., January 20-22. George T. Seabury, secretary, 33 West 39th St., New York, N. Y.

American Society of Mechanical Engineers—Annual meeting, Astor Hotel, New York, N. Y., November 30-December 4.

National Exposition of Power and Mechanical Engineering—Madison Square Garden, New York, N. Y., November 30-December 4.

National Association of Manufacturers—Congress of American Industry, Waldorf-Astoria Hotel, New York, N. Y., November 30-December 4. G. G. Geddis, 14 West 49th St., New York, N. Y.

American Society of Agricultural Engineers—Fall meeting, LaSalle Hotel, Chicago, Ill., December 7-9. Raymond Olney, secretary, St. Joseph, Mich.

Previously Listed

International Municipal Signal Association—Annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa., October 4-7. Irvin Schulsinger, secretary, 8 East 41st St., New York, N. Y.

International Association of Electrical Inspectors—Western Section, Book-Cadillac Hotel, Detroit, Mich., October 5-7. F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Eastern Section, Taft Hotel, New Haven, Conn., October 12-14. F. N. M. Squires, secretary, 85 John St., New York, N. Y. Southern Section, John Marshall Hotel, Richmond, Va., October 19-21. C. M. Jones, secretary, 307 Trust Company of Georgia Bldg., Atlanta, Ga.

Electrochemical Society — Fall meeting, Hotel Statler, Detroit, Mich., October 7-10. Colin G. Fink, secretary, Columbia University, 3000 Broadway, New York, N. Y.

Kansas Association of Municipal Utilities—Annual convention, Porter Hotel, Beloit, Kans., October 12-13. L. C. Angevine, secretary, City Hall, McPherson, Kans.

American Society of Mechanical Engineers—Fall meeting, Hotel Sagamore, Rochester, N. Y., October 12-14. Ernest Hartford, executive assistant secretary, 29 West 39th St., New York, N. Y.

American Welding Society—Annual meeting, Hotel Cleveland, Cleveland, Ohio, October 12-15. Miss M. M. Kelly, secretary, 29 West 39th St., New York, N. Y.

Engineers Council for Professional Development—Annual meeting, Engineering Societies Building, 29 West 39th St., New York, N. Y., October 18. H. H. Henline, secretary, 29 West 39th St., New York, N. Y.

Edison Electric Institute — Electrical equipment committee, Gibson Hotel, Cincinnati, Ohio, October 19-20; transmission and distribution committee, Gibson Hotel, Cincinnati, Ohio, October 19-20. Col. H. S. Bennion, managing director, 420 Lexington Ave., New York, N. Y.

Pacific Coast Electrical Association—Business Development, Administrative Services and Operating Economics sections, Californian Hotel, Fresno, Calif., October 22-23. V. W. Hartley, managing director, 601 West Fifth St., Los Angeles, Calif.

National Electrical Manufacturers Association—Annual meeting, Waldorf-Astoria Hotel, New York, N. Y., October 26-30. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

National Safety Council—Annual congress, Sherman Hotel, Chicago, Ill., October 27-29. N. H. Dearborn, managing director, 20 North Wacker Drive, Chicago, Ill.

National Association of Railroad and Utilities Commissioners—Annual convention, Baker Hotel, Dallas, Tex., November 10. Ben Smart, secretary, 7411-13 New Post Office Bldg., Washington, D. C.

Ellis to Manage Coop Association

Congressman Clyde T. Ellis, Arkansas Democrat, recently defeated for nomination to the U. S. Senate, has been appointed executive manager of the National Rural Electric Co-Operative Association, it is announced by the group's board of directors.

The association seeks membership from the 800 REA co-ops, offering organized political leadership before government agencies in behalf of rural electrification. President is Steve C. Tate of Georgia. In accepting the office Ellis issued the following statement outlining his policy:

"The NREC Association promises to be one of the most powerful organizations in America. Its need has long been recognized. Farmers have suffered from the lack of it. I have accepted the position believing this organization can make a great contribution to the war effort and to the welfare of the American people now and after the war."

The recently organized National Rural Electric Co-operative Association has launched a campaign to raise funds for its operation by getting individual co-operatives to pay $10 membership fees and 10 cents per year per connected customer in dues.

The association has sent out letters to the boards of directors of individual co-operatives, stating that it was organized because "before and since the enactment of the REA Act of 1936, utilities and their spokesmen, in and out of Congress, attempted by every foul means to scuttle the objectives of rural electrification."

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Emergency Field Ratings Allowed

WPB field offices have been authorized to grant emergency top priority ratings for small amounts of critical materials to prevent actual stoppages or slowdowns of essential production. For positive loss of production, the AAA rating may be granted; in other cases a rating of AA-2X is authorized.

During the initial month of the new procedure only ratings for aluminum, brass, refined copper, lead, nickel, pig iron, scrap steel, assorted structural steel, other steel except plate and zinc may be granted. After the trial operation, a dozen other critical materials will be added to the list, including rubber, tin, etc.

Washington emphasizes that the field ratings are to be granted only in exceptional cases where normal procedures are not quick enough.

Output Registers Slight Recession

A slight recession in the output figures for the week ended Sept. 26, compared with the previous week, is shown in the latest tabulation released by the Edison Electric Institute. The light and power industry distributed 3,720,254,000 kw.-hr. for the week ending the 26th, compared to 3,756,922,000 kw.-hr. for the week ending the 19th. The latest figures dropped the gain over the corresponding period in 1941 from 14.8 percent, registered for the 19th, to 13.7 percent increase for the current week.

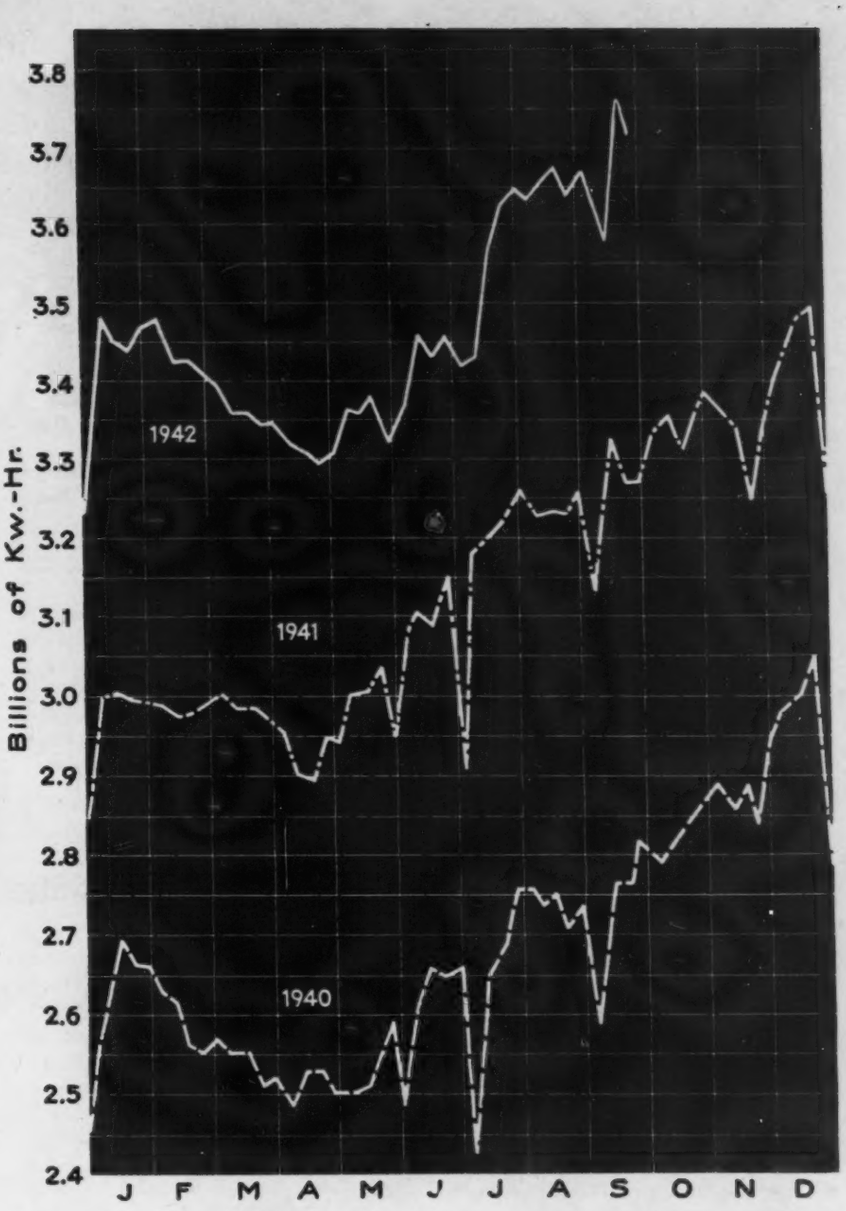
The Pacific Coast region increased its lead of the seven major geographic sections with a 30 percent jump over last year. The Southern States remained about static at 19.9 percent gain and all the other sections dropped a fraction of the increases registered the week before.

Weekly Output, Millions Kw.-Hr.

1942		1941		1940	
Sept. 26	3,720	Sept. 27	3,273	Sept. 28	2,816
Sept. 19	3,757	Sept. 20	3,273	Sept. 21	2,769
Sept. 12	3,571	Sept. 13	3,322	Sept. 14	2,773
Aug. 29	3,640	Aug. 30	3,261	Aug. 31	2,736
Aug. 22	3,674	Aug. 23	3,231	Aug. 24	2,714
Aug. 15	3,655	Aug. 16	3,238	Aug. 17	2,746
Aug. 8	3,637	Aug. 9	3,323	Aug. 10	2,743
Aug. 1	3,649	Aug. 2	3,263	Aug. 3	2,767
July 25	3,626	July 26	3,220	July 27	2,761
July 18	3,565	July 19	3,199	July 20	2,681

Percent Change from Previous Year

	Week Ending		
	Sept. 26	Sept. 17	Sept. 5 & 12
New England	+ 6.2	+ 7.5	+ 7.9
Mid-Atlantic	+ 8.2	+10.2	+ 7.5
Central Industrial	+ 9.2	+10.8	+ 9.2
West Central	+19.9	+11.9	+10.9
Southern States ...	+ 9.9	+19.8	+12.9
Rocky Mountain ..	+30.0	+12.5	+12.1
Pacific Coast	+....	+28.9	+28.0
Total United States	+13.7	+14.8	+12.2



Energy Sales Advance 13.2% in July

Sales of electric energy to ultimate consumers in July totaled 13,165,930,000 kw.-hr., compared with 11,634,154,000 kw.-hr. in July, 1941, an increase of 13.2 percent, according to the report issued by the Edison Electric Institute.

Generation by water power plants advanced only 16.9 percent over July, 1941, while in June the increase was 31.9 percent over June of last year.

Revenue from ultimate customers amounted to $232,460,300, compared with $217,827,200 in July, 1941, an increase of 6.7 percent.

Average annual use for the twelve months ended July 31 advanced to 1,011 kw.-hr. per customer from 972 kw.-hr. for the twelve months ended July, 1941. The average annual bill rose 1.6 percent, from $36.74 for the twelve months ended July 31 last year to $37.31 for the twelve months ended July 31, 1942. Revenue per kilowatt-hour dropped 2.4 percent.

Classification of Sales, July, 1942, and Change from 1941

Kilowatt-hour sales—During month of July	Million 1942	Kw.-Hr. 1941	% Change
Residential or domestic	2,053	1,927	+ 6.6
Rural (Distinct rural rates)	335	283	+18.1
Commercial or industrial			
Small light & power	2,247	2,045	+ 4.9
Large light & power	7,482	6,479	+17.2
Street & highway lighting	137	140	— 1.7
Other public authorities	322	247	+29.9
Railways and railroads			
Street & interurban	329	300	+ 9.8
Electrified steam	192	172	+11.9
Interdepartmental	69	41	+68.0
Total to ult. customers	13,166	11,634	+13.2

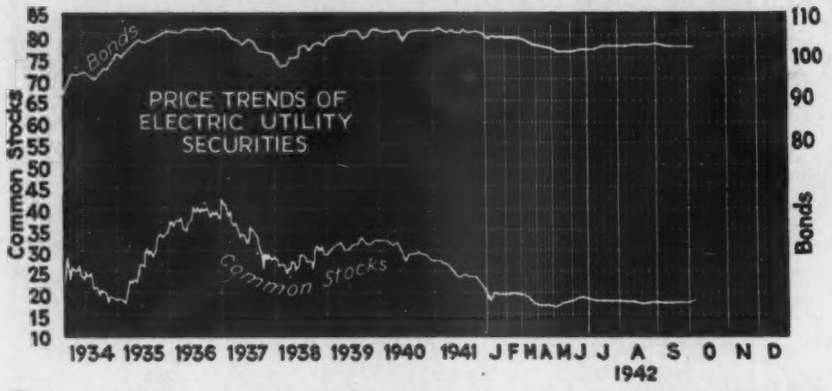
Energy Production Reaches New High

Production of electric energy for public use during the month of August totaled 16,031,777,000 kw.-hr., according to reports filed with the Federal Power Commission. This is the highest monthly production on record and represents an increase of 11.9 percent over August, 1941.

The average daily production of electric energy for public use for August was 560,552,000 kw-hr., establishing a new all-time high. This is an increase of 3.5 percent when compared with the average daily production during the month of July, 1942.

Production by water power in August amounted to 5,295,256,000 kw.-hr., or 33.0 percent of the total output for public use.

Utility Stocks Improve; Bonds Also Gain


PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
Bonds
Common Stocks
Common Stocks
Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1934 1935 1936 1937 1938 1939 1940 1941 J F M A M J J A S O N D
1942

Electric utility stocks gained considerable ground during the past week. "Electrical World" index advanced to 18.2 from 17.9 the previous week; last year, 23.4. Bonds went to 103.1 from 103.0 the previous week; last year, 105.8

G.E. Groups Gain Exemption Extension

The SEC has extended until August 31, 1943, exemption of the General Electric Co., the Electrical Securities Corp. and the G. E. Employees Securities Corp., from provisions of the Holding Company Act which would require them to register as a public utility company, in order that they might carry out an exchange of securities.

Following application to the commission, the companies were granted the conditional right to carry out a plan whereby General Electric would acquire, through Electrical Securities Corp. and the G. E. Securities Corp., 40,000 shares of Southwestern Public Service Co. common stock in exchange for 40,000 shares of Community Power & Light common, pursuant to a merger of Community into Southwestern (ELECTRICAL WORLD, September 19, page 76). The group had also applied for the right for General Electric, under a similar arrangement, to acquire 16,000 shares of Southwestern common stock under the exercise of rights under subscription warrants of Southwestern.

Approval of the two transactions was conditioned upon the applicants' selling of a sufficient number of the 56,000 shares so that by August 31, 1943, they would not own, control or hold power to vote more than 5 percent of the voting securities of Southwestern.

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Make Power Survey

Pend Oreille and Stevens counties are uniting in a resource and power load survey, according to A. B. Lind of Addy, Wash., president of the Public Ownership League of Washington. The survey is being made with the co-operation of the Bonneville Administration. Paul J. Raver, Bonneville administrator, has expressed the opinion that when the survey is completed it will be a model for future surveys of this sort.

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Associated Sells Louisiana Utility

Associated Electric Co., a unit of the Associated system, has contracted to sell Louisiana Public Utilities Co., a subsidiary, for a base price of $3,000,000, it was announced last week by Denis J. Driscoll and Willard L. Thorp, trustees in reorganization of the Associated Gas & Electric Corp. The purchasers are G. C. Hyde, D. Gordon Rupe, Jr., and Robert A. Ritchie, Texas capitalists, who will operate the company. No public distribution of securities is contemplated, it was said.

Louisiana Public Utilities supplies electricity to about 12,000 customers, gas to 4,500 customers and water and ice to another 1,250 in a number of Louisiana communities. Gross revenues for the twelve months ended July 31, 1942, amounted to $1,534,000, of which the major portion, $806,000, came from sales of electricity. Gross income for the same period amounted to $340,329.

None of the proceeds from the Louisiana Public Utilities sale will be directly available to the parent company, the trustees said, since Associated Electric Co. has a large amount of debt securities outstanding in the hands of the public. According to A. F. Tegen, Associated Electric president, the company contemplates filing an application with the SEC which, if approved, would permit it to acquire its own debentures from other companies of the system out of "substantial cash resources." Certain of the funds may also be used, it was said, to expand the properties of the Pennsylvania Electric Co.

•

SEC Refuses U.G.I. Plea for Stay

The Securities and Exchange Commission this week rejected a motion that it stay proceedings concerning divestment by the United Gas Improvement Co. of its holdings in the Public Service Corp of New Jersey. U.G.I. counsel had moved that the proceeding be held in abeyance until a recent SEC ruling, since upheld by the Third Circuit Court, that Public Service is a subsidiary of U.G.I. and United Corp., could be heard and acted upon by the Supreme Court. The commission's decision not to stay the hearing came at the climax of a hearing during which William W. Bodine, president of U.G.I., testified that the company would fight to the Supreme Court any SEC order requiring U.G.I. to dispose of its Public Service interests.

"Our decision on the motion presented", said the commission, "is that the proceeding will not be stayed. U.G.I. may introduce any additional pertinent evidence. When that evidence is introduced and the staff has had an opportunity to present any pertinent evidence in rebuttal, the examiner is instructed to close the record."

Even though the Supreme Court might reverse the Third Circuit Court decision and find Public Service not a U.G.I. subsidiary, the commission said, U.G.I. would have adequate opportunity under the last sentence of Section 11(b) to request modification of any order the commission might issue with respect to Public Service. Argument by U.G.I. for a stay, the commission pointed out, was predicated on the assumption that it may be found that Public Service was not a subsidiary, but merely an investment interest.

Utility Reports

	Net Income	
	1942	1941
*Alabama Power	$3,270,636	$3,214,978
†California-Oregon Power	1,018,143	897,010
*Central Maine Power	1,865,691	2,121,137
*Central Vermont Public Serv.	192,806	352,165
*Commonwealth & Southern and subs.	10,698,014	11,794,098
*Consumers Power	8,278,712	9,715,409
*Georgia Power	5,455,554	5,223,736
*Kansas City Power & Lt.	3,046,182	3,526,939
†Louisville Gas & Elec.	3,097,738	2,774,581
*National Power & Light and subs.	4,580,437	8,600,879
*Northern Indiana Pub. Serv.	2,156,502	2,867,238
*Ohio Edison	3,289,890	3,876,355
*Public Service of N. H.	1,403,465	1,350,823
*Twin State Gas & Elec.	150,683	256,272

*Twelve months ended August 31.
†Twelve months ended July 31.

HOW DESIGN . . . CONSTRUCT OPERATE MAINTAIN

Crossover Construction Guard

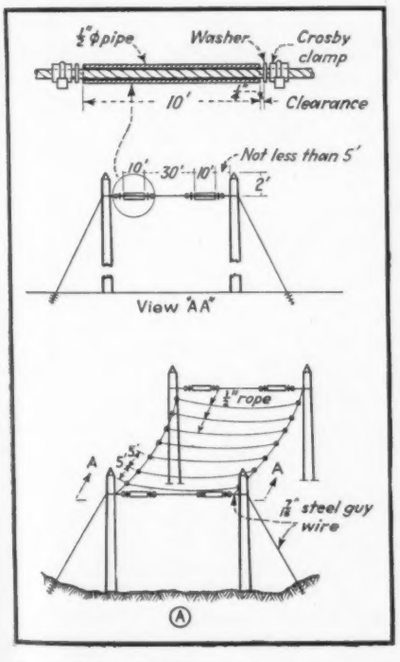
By CLAYTON M. ALLEN
Senior Electrical Engineer, Design and Construction Division, Los Angeles Bureau of Power and Light

Protective guard structures are vitally necessary to speedy and safe conductor stringing operations, particularly along rights-of-way traversed by many highways, railways and power communication lines.

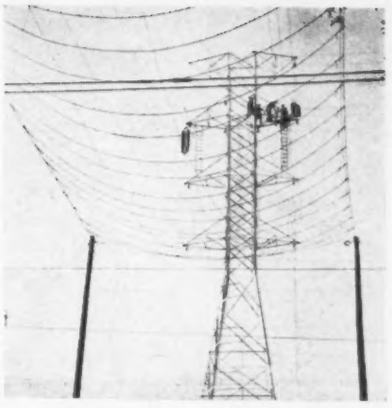
Construction engineers of the Los Angeles Bureau of Power and Light have designed a standard protection scheme of poles, steel guy wire and rope cradles which is effective and easily installed. Two poles of equal height are set along the edge of the right-of-way or object to be crossed, each spaced about 10 ft. outside of the outside conductors. One $\frac{7}{16}$-in. diameter steel guy wire extends through a hole near the top of the poles and attaches to anchors along, and parallel to, the way or object to be crossed, and at right angles to the transmission line. On this guy wire are 10-ft. lengths of $\frac{1}{2}$-in. diameter pipe or conduit.

These pipes act as rollers and are spaced at the correct locations by the use of cable clips and washers and prevent damage to the conductor during "pulling-in" operations. Across wide highways or other rights-of-way it is often necessary to provide additional safety measures in order to maintain traffic in these locations, and rope nets or cradles are assembled on the ground and pulled out over two ropes connecting the two structures on opposite sides of the highway at the poles.

Should the "pulling-in" line or conductor become slack and fall onto the guy wire guards or rope cradle, no damage is done to conductors, nor is the service on the highway, power or communication lines interrupted.



SCHEMATIC DIAGRAM of crossover protection guard
Erected over highways, railways or communication or power lines during transmission line construction. Guys are threaded through the drilled poles in one piece from anchor to anchor and at right angles to right-of-way with down leads in line with poles. The eyes at the 1/2-in. rope ends are made to slide on the 1-in. ropes previously pulled tight in place.



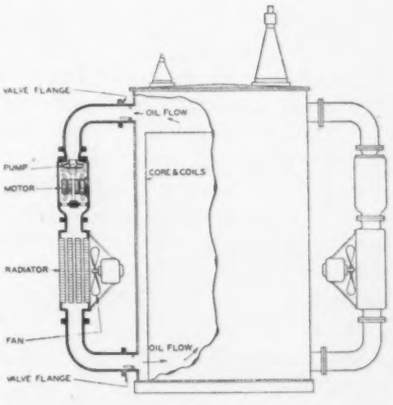
PROTECTION guard erected over railway during construction of a 132-kv. steel tower transmission line

•

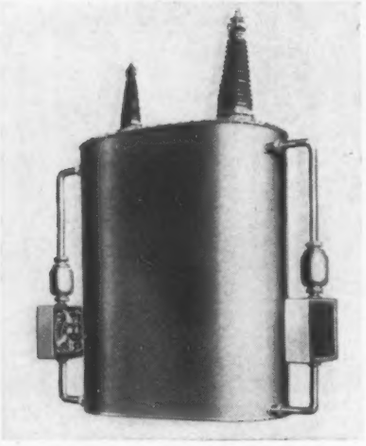
Packaged Units Boost Transformer Ratings

By G. W. CLOTHIER
Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Ready relief for utility and industrial power transformer capacity beleaguered by growing war loads is to be found in new factory-built, self-contained, forced-oil cooling units for substation power transformers, developed by the Allis-Chalmers Manufacturing Company. The new units consist of an oil-immersed, inclosed pump mounted on a heat exchanger and pipe connected directly to the



SECTIONAL VIEW of forced-oil cooling unit



SELF-CONTAINED, forced-oil-cooling units attach directly to transformer radiator valves

transformer radiator valves. A cross-section through the so-called Electro-Cooler unit is shown in the accompanying sketch.

When specified on new transformers, Electro-Cooler units permit purported savings of 20 to 25 percent in copper and steel for the same transformer capacity. Applied to transformers already in service, the rating in the case of self-cooled transformers can be increased as high as 60 percent, the manufacturer states. The capacity increase possible on old units, of course, depends upon the particular transformer design and upon bushing and tap-changer capacity, circuit breaker ratings and other factors. Each installation should be considered by the particular transformer manufacturer.

Advantages of forced oil cooling of transformers has long been recognized by transformer manufacturers and users. It has been rather difficult to apply. Maintenance has been fairly high for the system in service and troubles encountered with oil leaks, dependence on motors and fans and difficulty in finding room for bulky coolers have been reasons for its limited use in the United States.

In the new forced oil coolers the pump is entirely inclosed. A three-phase motor is on the same shaft with the pump. Oil flows through the motor, thus eliminating the necessity for stuffing flanges, external shafts or gaskets. It provides a completely sealed pump and eliminates any possibility of oil leaks. The pump is supported by the inlet and outlet pipes so that no additional brackets are needed.

Heat-exchanger elements consist of a fin-type radiator with a propeller fan mounted on it, the whole unit supported by connecting pipes. Thus the connecting pipes, bolted to the transformer through standard radiator valves, support the entire cooler and eliminate additional foundations. It keeps the length of piping to a minimum and reduces any possibility of oil seepage in long pipe lengths.

Because the new cooling unit is relatively small, more than one is usually required, the number depending upon the size of the transformer. Greater reliability can be expected with multiple units since operation of one is not dependent upon the other.

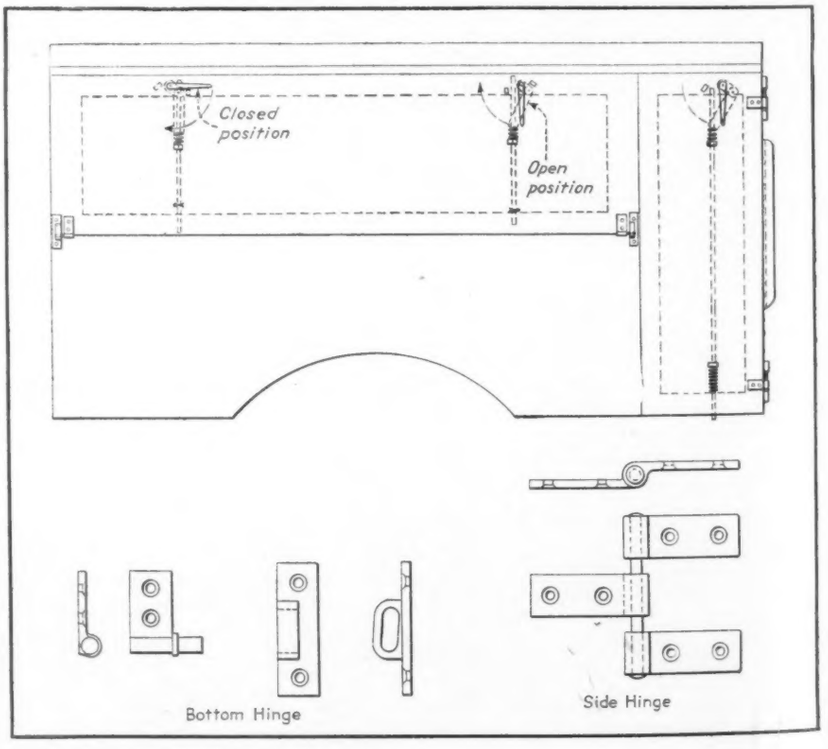
The entire Electro-Cooler, connecting pipes, motor, pump and heat exchanger is factory-assembled and tested so that assembly in the field is as simple as mounting an ordinary radiator on a standard self-cooled transformer. On new transformers, standard radiator valves are used at the top and bottom of the tank in the conventional locations and the Electro-Cooler attached to them. Old transformers having suitable radiator valves may have a radiator removed and the forced oil cooler put in its place without draining the oil or having the transformer out of service for more than a few hours (usually three or four is sufficient). As previously stated, however, the increase in capacity of old transformers obtainable by forced oil cooling depends on the particular transformer design and other related factors and requires attention of the transformer manufacturer.

•

Weatherproof Door for Truck Tool Box

Boxes for tools and materials built into the sides of line trucks should have weathertight doors, otherwise rain and snow cause water to seep in around the doors, which is not good. What is needed is a drip-proof door that will close tightly and open easily.

An ingenious solution of the problem, seen on the line trucks of the Alabama Power Company, is shown in the accompanying drawing. The top edge of the door is beveled, low side of the bevel outside. There is a matching bevel in the door frame. A lever and rod device, one or more on each door and operated by a quarter turn of the door handle, raises the door and brings the two bevels together, thus effecting a weatherproof closure. To allow the door to be raised the hinges are special, one



DOOR is raised to make rain-proof closure

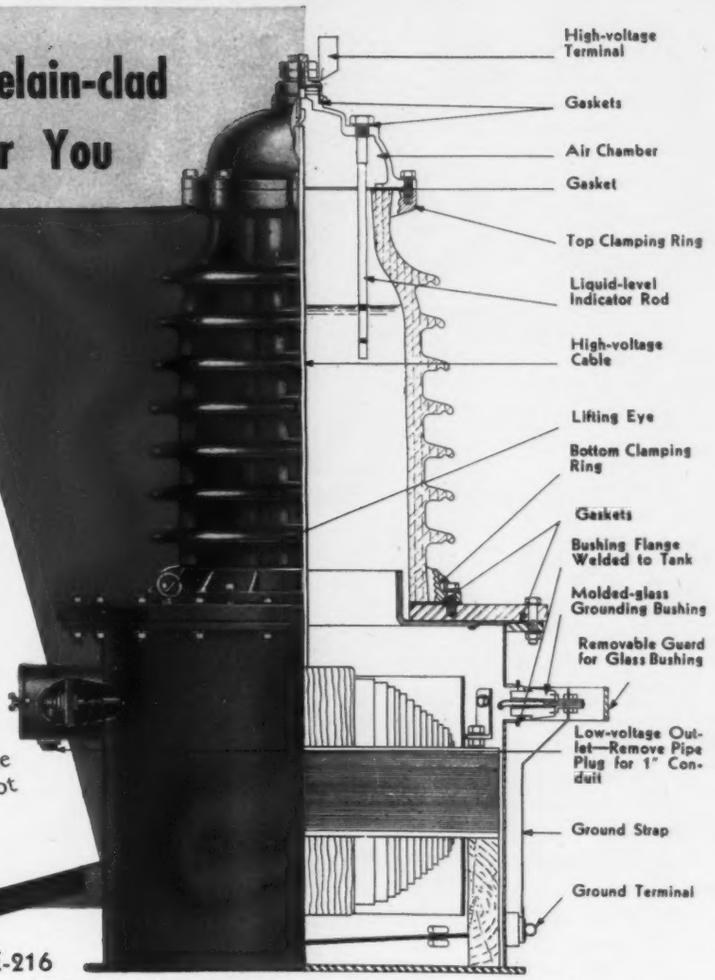
Here's What These Porcelain-clad Transformers Will Do for You

1. SAVE COPPER
Their light weight and small size (for the 69-kv unit, only 1100 lb and 4½ ft high) enable you to mount them in the steel structure and thereby reduce the length of copper runs.

2. SAVE SPACE
Mounting them in the steel structure saves valuable ground space.

3. SAVE FOUNDATION EXPENSE
Mounting in the structure also eliminates the need for constructing a separate foundation.

4. REDUCE MAINTENANCE
Hermetically sealed in, the insulating liquid need not be tested or inspected.



TYPE E-216

69-kv Single-bushing Potential Transformer (Available from 23 kv to 69 kv)

and you get these excellent operating characteristics!

ACCURACY—Well within the highest accuracy classification—¼W, ¼X, ¼Y, ¼Z—these transformers are suitable for both metering and relaying—line to neutral, on grounded and ungrounded circuits.

INSULATION—Impulse levels meet the test requirements established by ASA Standards.

IMPULSE FLASHOVER—The porcelain housing acts as a high-voltage bushing and has the same 60-cycle and impulse-flashover characteristics as the conventional-type bushing. For example, the following data apply to the 69-kv size:

60-cycle, dry, 1-minute-withstand test—175 kv
60-cycle, wet, 10-second-withstand test—145 kv
Full-wave-impulse-withstand test—350 kv

You can adopt G-E instrument transformers as standard throughout your system, for General Electric makes a complete line—indoor and outdoor, current and potential, and portable types.

For additional information about the E-216 or other types, address the nearest G-E representative. *General Electric, Schenectady, N. Y.*

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in five plants manufacturing naval equipment

For the "Last Ounce" of Protection SPECIFY PYRANOL

Because these transformers are such a vital link in the protection of your system, you'll want to insist on Pyranol—the G-E insulating and cooling liquid which is chemically stable and will not sludge. Pyranol also means greater safety, for it is noninflammable and adds little to the price of the transformer.

GENERAL ELECTRIC

form for a bottom-hinged door and another for a side-hinged as appears in the drawing.

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Voltage Recorders on Portable Racks

By A. C. FORT
Engineer Jersey Central Power & Light Company, Morristown, N. J.

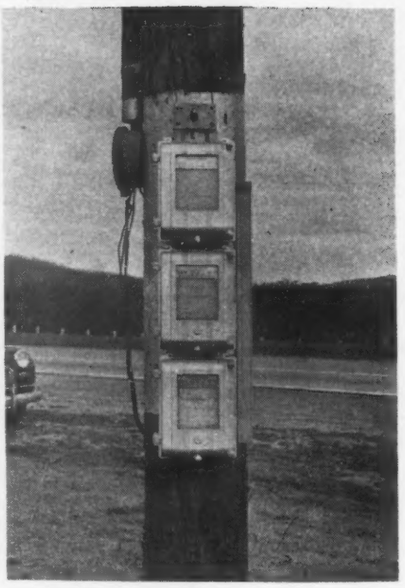
Combination of some recording voltmeters, some old 1½-kva. transformers and a dash of ingenuity has provided the Jersey Central Power & Light Company with an accurate means of checking voltage drop at any desired point on its system.

At varying distances from substations certain poles have been selected as checking points. On each of these the utility has mounted a 1½-kva. transformer resurrected from slow-moving stock in its warehouse. Leads for each of the three phases are brought from the transformer through standard cutouts and extended in a fibre duct to a junction box mounted about 6 ft. above the ground.

Three CF-1 inkless recording voltmeters have been mounted on a specially designed rack made of light angle iron. The frame is easily hooked onto a large screw already in place on the pole. It is then only necessary to connect the recorder leads to the terminals in the junction box through conventional clips as shown in the illustration.

No housings are necessary for the recorders, which have operated in temperatures as low as 10 deg. below zero without trouble. The inch-an-hour charts are easily removed and analyzed.

On one line where this checking method has led to the installation of capacitors as a corrective measure the



INKLESS RECORDERS on portable rack verify customer voltages

following voltage conditions existed during peak-load periods:

Voltage at first customer	123 volts
Voltage at last customer	110 volts

After the capacitors were installed, during the peak-load period, voltage at the first customer was 123 volts; at the last customer, 118 volts. During light-load period the first customer's voltage was 118 volts and the last customer's 123 volts.

•

Support 960-Ft. Span Without Steel Towers

Increasing load in a war industry served by the Central Vermont Public Service Corporation called for the construction of a 44-kv. circuit equivalent to No. 2 copper per phase along a river in a congested community involving a 960-ft. span between terminals. Rights-of-ways were difficult to obtain and the structural conflicts between buildings and line location appeared virtually insurmountable. It was necessary to connect substations "D" and "G" (Fig. 1) with three conductors, avoiding the inconvenience and expense of locating the line on shore in thickly settled territory. Structural steel of the fabricated galvanized variety was critical as to possible supply for use in terminal towers whose height would have to be of the order of 100 ft. to meet the conditions.

The problem was met by designing an intermediate support of guy wires which would split the span at "C" into two 480-ft. sections, the guy wires being carried across the river at right angles to the line between poles "A" and "B" on the opposite shores. The poles "A" and "B" were located 225 ft. apart, and as shown in Fig. 2, two ⅜-in. Siemens-Martin guy wires are used in the river crossing. These are increased to 7/16 in. properly to guy poles "A" and "B" (60 ft. and 55 ft. long, respectively) at their shore ends. The guys forming the river laterals are 5 ft. apart vertically and are tied together in the design by separators formed of ordinary wooden crossarm braces. The phase conductors of the transmission circuit are 10 ft. apart in horizontal spacing. The crossarm braces are to be clamped to the guy wires.

At the span ends up and down the river wooden poles "E" and "F" were utilized for the terminal structures. The greater part of the right-of-way is over water, with excellent separation of power conductors from buildings and other structures on shore, and the amount of critical material required was reduced to a minimum by this design, which has recently been approved by the government for construction.

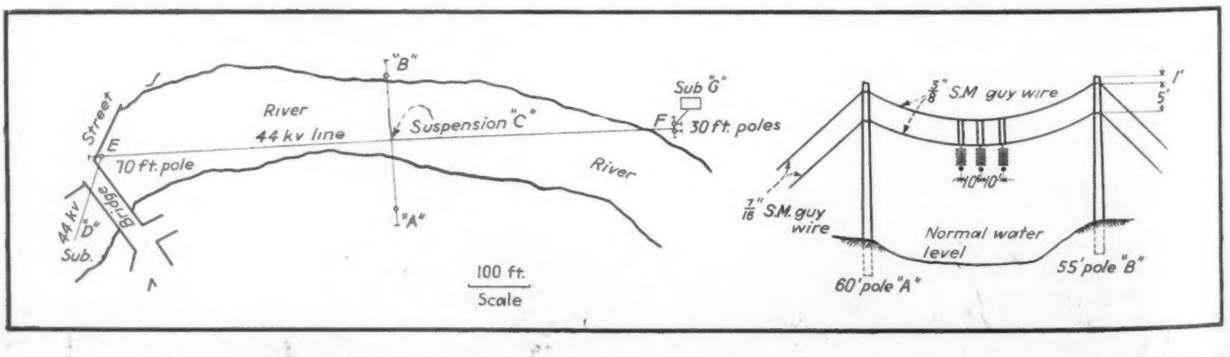


FIG. 1—Plan of 44-kv. circuit route along river with intermediate suspension structure at "C"

FIG. 2—Elevation of suspension structure (not to scale) at "C" (Fig. 1)

For REMARKABLE SAVINGS in LIGHTING WAR PLANTS

Does *twice* the work—yet costs the same as *one* Tulamp 100-watt ballast

USE THE NEW G-E FORLAMP BALLAST

FLUORESCENT lighting fixtures cost less, weigh less, and use much smaller amounts of critical materials when equipped with these new ballasts because *one* G-E Forlamp ballast will operate *four* 100-watt fluorescent lamps—a job that previously required at least two Tulamp 100-watt ballasts.

Compared with two Tulamp 100-watt ballasts, the new Forlamp ballast uses 48 per-cent less copper, 47 per-cent less iron and steel, and 50 per-cent less aluminum. Because it is priced exactly the same as one Tulamp ballast, you get, in effect, two ballasts for the price of one, a saving of 50 per-cent.

Saves Copper in Plant Circuits

Circuits carrying power at the higher distribution voltages require much less copper than circuits carrying the same amount of power at the lower voltages ordinarily used for lighting circuits. For example, when a given amount of power is distributed at 115 volts, 4.6 pounds of copper per foot is required, whereas only 1.4 pounds of copper per foot is required when the same amount of power is distributed at 265 volts.

The new Forlamp ballast operates within a voltage range from 250 to 280 volts, from power supplied by a Y-connected circuit either 254/440 volts, 265/460 volts, or 277/480 volts.

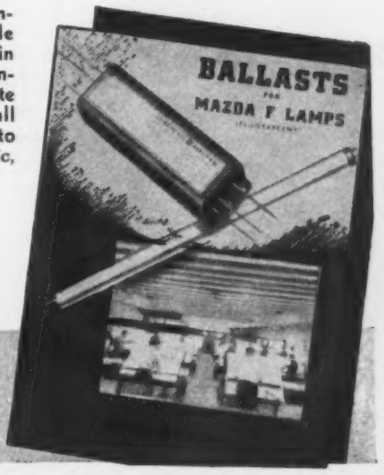
Many new war plants—particularly those with load-center distribution systems—have circuits carrying power at the higher voltages (between 250 and 280 volts). In most cases plants converting for war production can easily provide the proper voltage for operating the new Forlamp ballasts on their lighting circuits.

Savings in Power

Electrical losses in a Forlamp ballast are 46 per-cent less than the losses of two Tulamp ballasts. This makes possible the operation of four 100-watt lamps at rated lumens of light output with 8 per-cent less power consumption.

In one large bomber-plant lighting installation, this has meant the release of 303 kilowatts of power for other uses.

Write today for complete information on this remarkable new ballast. Ask for Bulletin GEA-3293D. It contains information on the complete line of G-E ballasts for all MAZDA F lamps from 4 to 100 watts. ***General Electric, Schenectady, N. Y.***



The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment

GENERAL ELECTRIC

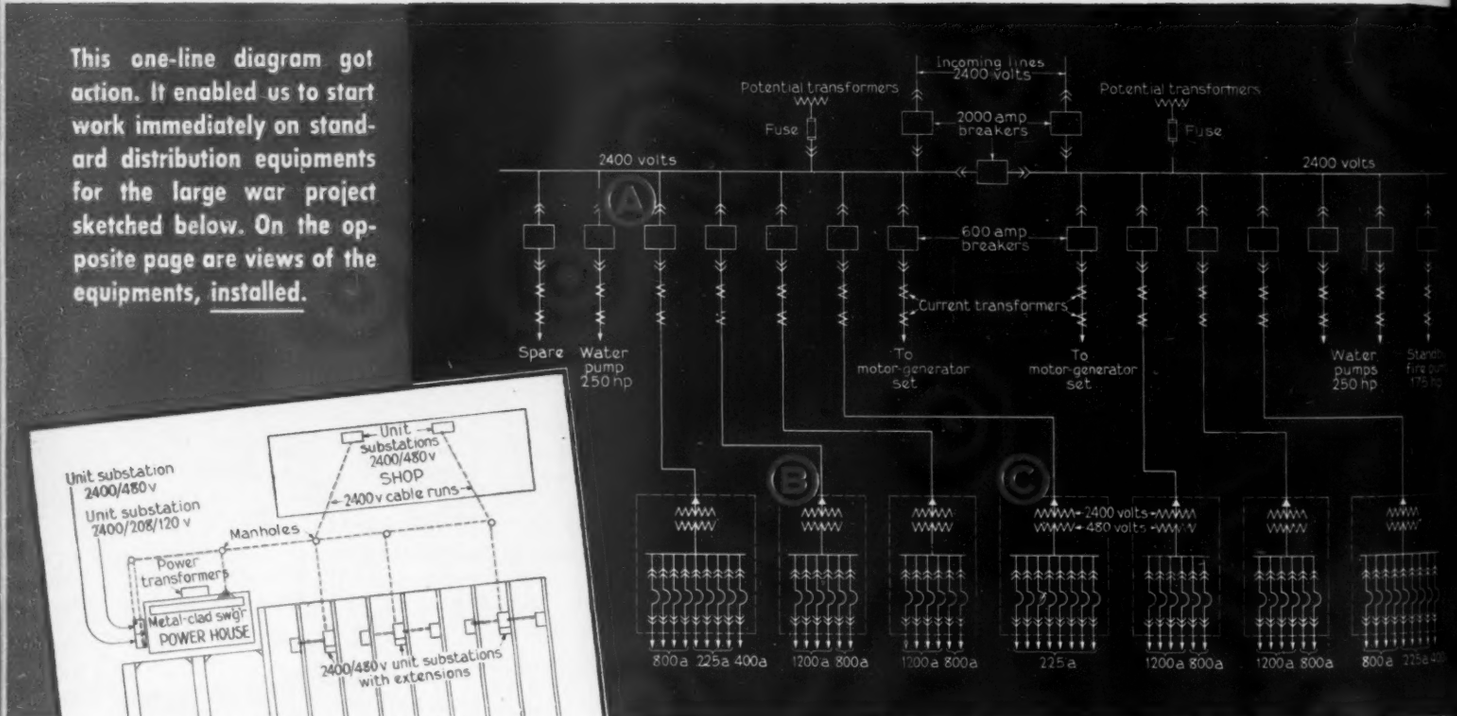
SEE HOW "one-line action"

"Just give us a simple one-line diagram and we'll go right to work on standard equipments."

— from a recent General Electric advertisement

GOT THIS WAR PLANT ROLLING MONTHS SOONER

This one-line diagram got action. It enabled us to start work immediately on standard distribution equipments for the large war project sketched below. On the opposite page are views of the equipments, installed.



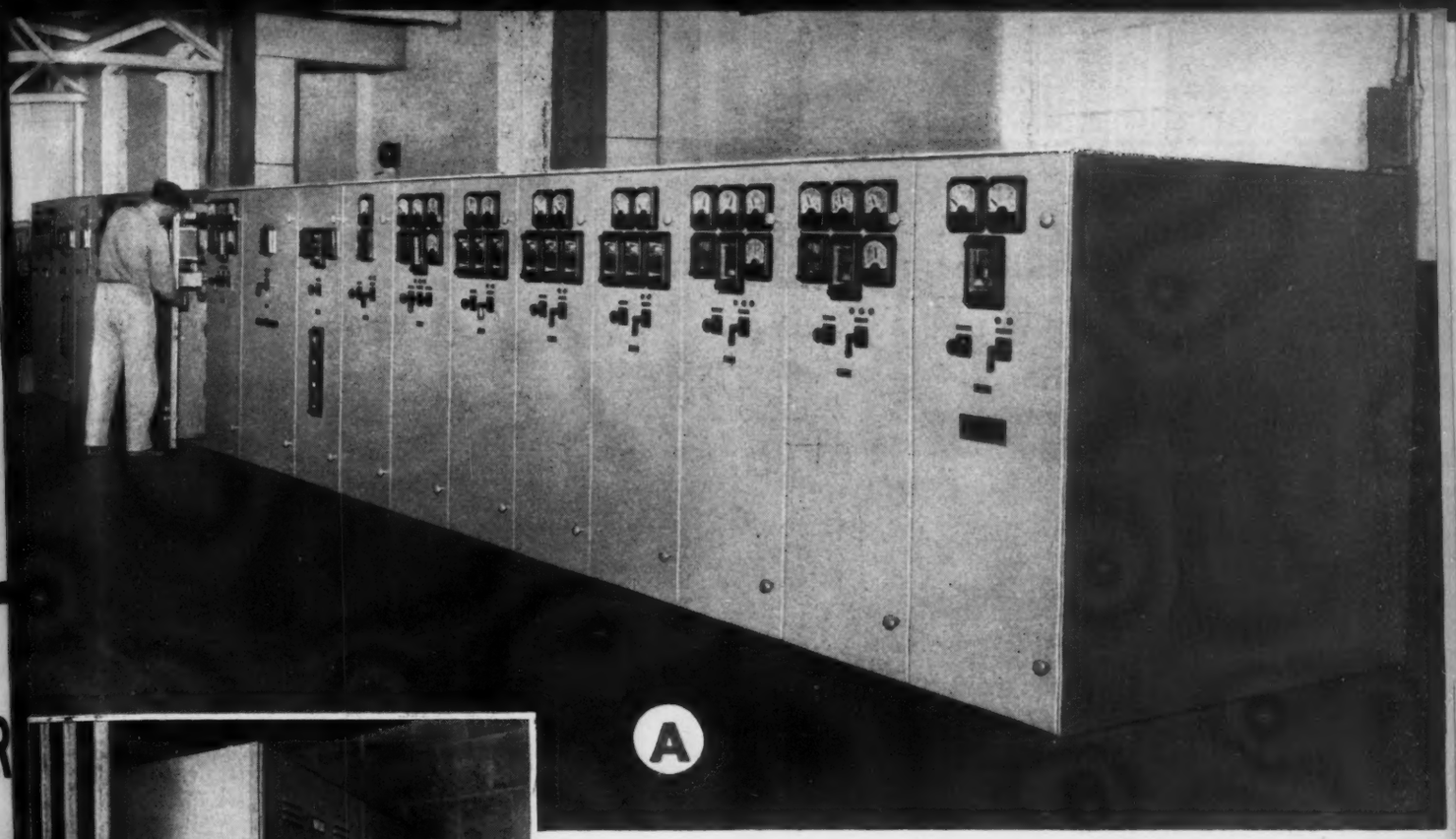
Saved Months — and 145 tons of copper

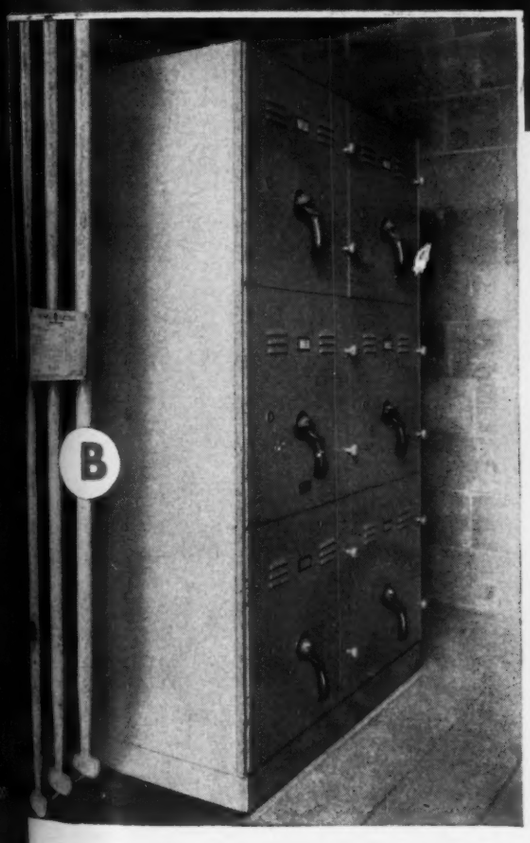
THEY Used Load-center Distribution— High-voltage power goes right to load-center unit substations, from where it is distributed directly to the loads through *short*, low-voltage secondaries. This reduced the amount of cable copper to *one-seventh*— saved more than 290,000 pounds of hard-to-get copper.

They Used Standard G-E Equipments— Standard G-E metal-clad switchgear equipments and unit substations were ordered at an early stage of construction. These "packaged" units arrived at the job when needed, and were installed quickly and easily. The safety metal-enclosed construction protects personnel and gives extra assurance of service continuity.

Standard G-E load-center units will get your machines rolling months sooner than is possible with nonstandard equipments, with tons less copper and other war-vital materials. Ask the nearest G-E office for additional information. *General Electric Company, Schenectady, N. Y.*

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in five plants manufacturing naval equipment

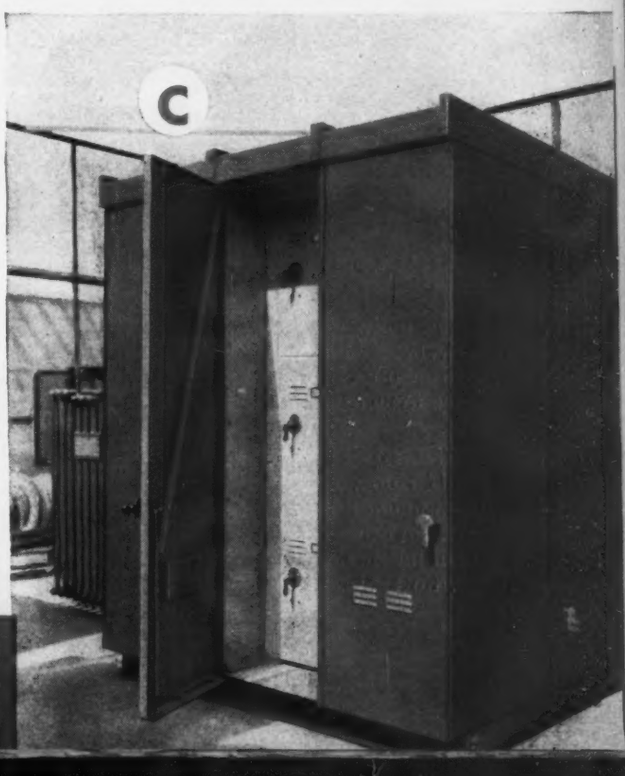




A METAL-CLAD SWITCHGEAR EQUIPMENTS—Our factory went right to work on these safety-enclosed, *standard* switchgear equipments, which protect and distribute primary power. Here they are shown installed—fully co-ordinated, metal-clad assemblies of breaker, instrument transformers, buses, and all associated equipment. They were received all ready to be set in place and connected.

B INDOOR LOAD-CENTER UNIT SUBSTATION — Load-center unit substations were put in to transform primary power at the load center, and distribute power at 480 volts right to the loads. These *standard* units are complete, combining Pyranol transformers, easily removable air breakers, current transformers, and buses, all co-ordinated as an integral part of the load-center unit substation.

C OUTDOOR LOAD-CENTER UNIT SUBSTATION—Here is one of the *standard* outdoor unit substations, installed. The unit substations, too, were received all ready to be set in place and connected.



Planning a New Plant, or Extension?

These three steps will help you to order standard switchgear equipments and unit substations for new war-production plants at an early stage of construction:

1 ***Calculate the total kva you will need.*** Your consulting engineers can help you to determine this accurately.

2 ***Divide the total load into separate load zones of 500, 750, or 1000 kva each.***

3 ***Divide the load of each zone into feeder loads*** and draw a one-line diagram of your proposed load-center system, showing the functions to be performed and the ratings required. ***With this one-line diagram you can immediately order your standard switchgear equipments and unit substations.***

For further aid, ask for our new bulletin GED-1006

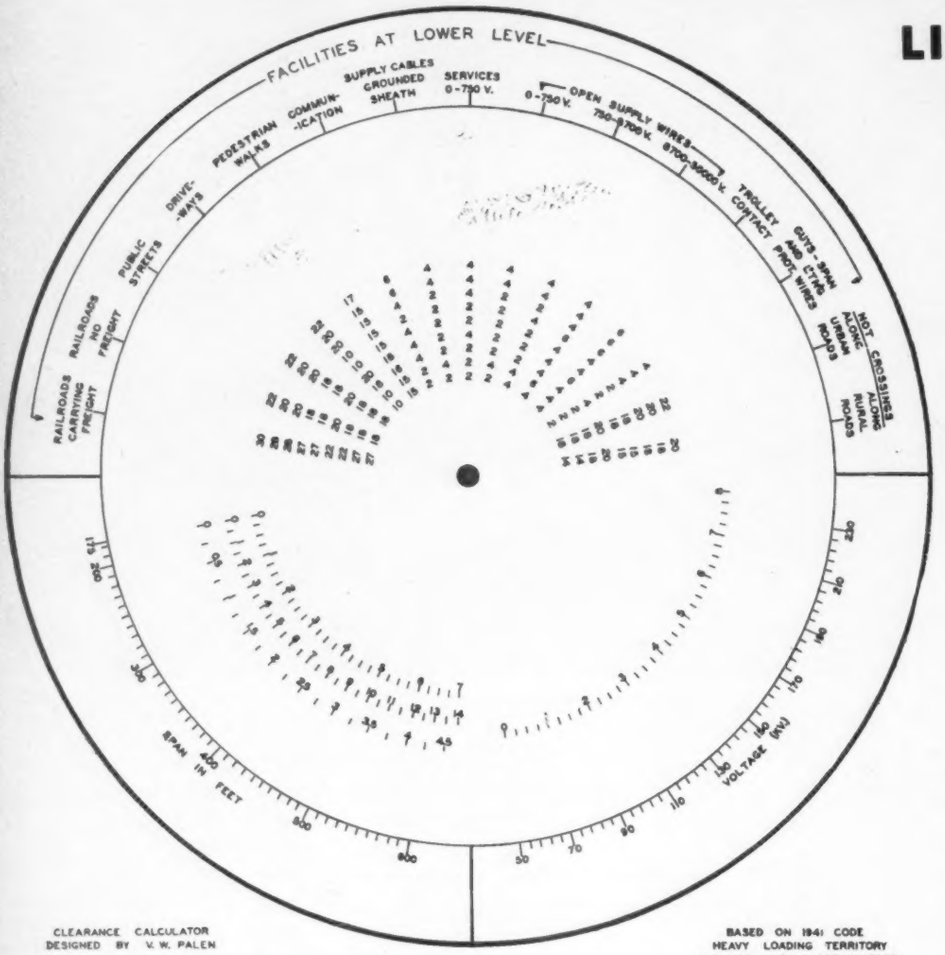
GENERAL ELECTRIC

LINE CLEARANCE CALCULATOR

By VERNON W. PALEN
Eau Claire, Wis.

THE CALCULATOR shown was designed to determine the required clearance for different crossing conditions where public utility service facilities of various kinds cross railroads, streets, walks, communication lines, supply cables, open supply wires, etc. The calculator design is based on the 1941 National Electrical Safety Code requirements for the heavy loading district.

It is to be noted that there are a number of conditions where the code permits clearances smaller than are given by the calculator. The code should be consulted, therefore, where it is found difficult to provide the clearances shown by the calculator. It is to be noted, for example, that increased clearances (factors B and C) are not required for trolley contact conductors, guys and for cables supported by messengers except where they cross over other wires. The following examples illustrate proper use of the rule.



CLEARANCE CALCULATOR
DESIGNED BY V. W. PALEN

BASED ON 1941 CODE
HEAVY LOADING TERRITORY
FACTORS A, B & C ARE IN FEET

Problem 1—Find vertical clearance between supply line and communication line when crossing occurs at center of supply 2/0 line span when: (a) supply line span is 150 ft., voltage 22 kv.; (b) span 310 ft., voltage 22 kv. and (c) span 310 ft., voltage 74 kv.

Solution:—(a) Set arrow at "Communication," read factor A equal 6 ft., opposite voltage range of 15,000 to 50,000 volts. This is required clearance for spans up to 175 ft.

(b) Proceed as in (a), finding factor A of 6 ft. Now set arrow opposite 310-ft. span, read factor B equal 2 ft. Add factors A and B for required total clearance of 8 ft.

(c) Proceeding as in (a) and (b), basic clearance for 310 ft. and 22 by kv. is found to be 8 ft. Increased clearance for 74 kw. found to be 1 ft., by setting arrow opposite 74 kv. Total required clearance is 9 ft. or sum of factors A, B and C.

WHEN CROSSING OCCURS AT CENTER OF UPPER SPAN
REQUIRED CLEARANCE = FACTOR A + FACTOR B + FACTOR C

WHEN CROSSING IS NOT AT CENTER OF UPPER SPAN AND FACTOR A IS 4 OR MORE MULTIPLY SUM OF FACTOR A + FACTOR B + FACTOR C BY FOLLOWING CONSTANTS TO GET REQUIRED CLEARANCE EXCEPT THAT IN NO CASE CAN THE CLEARANCE THUS OBTAINED BE LESS THAN FACTOR A.

DISTANCE CROSSING TO NEAREST SUPPORT	FOR FACTOR A		FOR FACTOR A
% OF SPAN LENGTH	4 FT.	6 FT.	10 FT. OR MORE
5	0.35	0.47	0.85
10	0.47	0.58	0.88
15	0.60	0.68	0.91
20	0.71	0.78	0.94
25	0.82	0.85	0.96
30	0.90	0.92	0.98
35	0.96	0.98	0.99
40-50	1.00	1.00	1.00

Problem 2—Same problem as above (c) what vertical clearance is required for crossing at point 46½ ft. (15% of 310-ft. span) from nearest support.

Solution:—From table at bottom of calculator note for factor A of 6 ft. a multiplier of 0.68 is to be applied. Multiply answer problem (c) above (9 ft. x 0.68) by factor to get 6.12, the required clearance.

Problem 3—What is required clearance for 74-kv. conductors above ground when along rural roads if span is 375 ft.

Solution:—Set arrow opposite "along rural roads," read factor A equal 20 ft., opposite 15,000 to 50,000 volts. Set arrow opposite 375-ft. span. In window marked "window D" read factor B equals 2 ft., now set arrow opposite 74 kv. and read factor C equals 1 ft. Add factors A, B and C to get 23 ft., the answer.

NOTE—In actual use two parts of the calculator are centered on each other.

SET ARROW AT PROPER POINT
FACILITIES AT UPPER LEVEL
BASIC CLEARANCE FACTOR A
15000-50000 V.
8700-15000 V.
750-8700 V.
OPEN SUPPLY WIRES AND SERVICE DROPS
0-750 V. OPEN SUPPLY WIRES - SUPPLY CABLES WITH GROUNDED SHEATH & ASSOC. MESSENGERS
SERVICE LINE
OVER 750 V.
0-750 V.
TROLLEY CONTACT AND ASSOCIATED MESSENGERS
COMMUNICATION INCL. CABLES & MESS'NG'RS
GUYS-LIGHTNING & SPAN WIRES
INCREASED CROSSING CLEARANCE FOR SPANS OVER 175 FT.
SMALL CONDUCTORS NO. 4 ALUM. NO. 6 COPPER NO. 8 STR. COPPER & SMALLER
ALL CROSSINGS EXCEPT THOSE IN WINDOW D
WINDOW D
FACTOR B
LARGE CONDUCTORS
SMALL CONDUCTORS
STREETS, ALLEYS, ROADS DRIVEWAYS & PEDESTRIAN WALKWAYS
INCREASED CROSSING CLEARANCE FOR VOLTAGE OVER 50 KV.
FACTOR C
SET ARROW AT SPAN LENGTH
SET ARROW AT VOLTAGE

Before Choosing a Method of Boosting Voltage

COMPARE COPPER REQUIREMENTS

REGULATORS CAN SAVE TONS OF COPPER

(Left) Copper required to raise voltage on a 2.8-mile feeder of No. 0 wire by rebuilding with No. 4/0. Shaded portion of right-hand bar represents copper saved by using regulators to do the same job. The total copper saved was 9 tons.

YOU will save *tons* of copper—and large amounts of steel and other vital materials—if you can enable your present distribution feeders to deliver more power, by installing voltage regulators instead of by rebuilding your feeders. In many cases this is possible since it is *voltage drop*, not *kilowatts* of power, that limits the available, useful capacity of distribution feeders. Consider the following example:

Assume a 1000-kva, 0.75-pf load uniformly distributed over a 2.8-mile feeder of No. 0 conductor. The drop along the feeder is 7 per cent with a 3-per-cent additional drop in the last transformer and customer's circuit. It is desired to add 500 kva of load. If it is added without provision for voltage regulation, the voltage drop becomes 13.5 volts—too much for maximum output from lamps, resistance-heating devices, and motors.

Of course, correct voltage level could be obtained by rebuilding the feeder and replacing the No. 0 conductor with No. 4/0. However, the new conductor would require ***19,150 pounds more copper.*** Since the regulator will require only ***350*** pounds of copper, the net saving of this vital material would be more than 9 tons—18,800 pounds.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

484-30-5400

More Steam—How?

10. Provision of Cleaning Devices*

By ALFRED IDDLES
Application Engineer Babcock & Wilcox Co.

True knowledge of temperature entering the superheater can now be available to any one who wishes to know. Such knowledge is certainly desirable, but does not give all of the answers needed to prevent slag. Some people determine the softening or initial deformation temperature of coal ash and then specify a temperature entering the tube bank or superheater lower than this. This is in no wise an answer to the question. The commonly available information about softening temperature is obtained by the A.S.T.M. method in a reducing atmosphere. The softening temperature may be 300 or 400 deg. higher than this in some furnaces. And again one may have the ash at a temperature far below the softening temperature when it enters tube surface, and if the velocities are high and the tube spacing is close slag troubles will result in spite of a widespread belief to the contrary.

I would think that an operator would prefer to have a minimum number of slag blowers and cleaning devices. Naturally he wishes a minimum of cleaning because, whether it be by mechanical means or hand, it is time-consuming and troublesome. Sometimes the specifications call for all needed cleaning devices, and if this were literally interpreted the unit might be covered with them because no one knows beforehand, unless the unit is a duplicate for duplicate conditions, what the exact results are going to be. Presumably the owner pays for the blowers, and I would think he would be wiser if he made provision for all that might possibly be needed, including observation and lance doors, and then installed those required by experience and closed up the doors proved not to be needed. This certainly would end up with a lesser amount of piping, valves and blowers to operate and maintain and use much less steam or air. Incidentally, he might find that the amount of cleaning needed in certain locations where slag was present was so infrequent that hand work would be much cheaper than mechanical blowing.

These are all features of the slag and dirt problem about which I believe operators should know when units are being designed and laid out. At least this is the story I would tell any operator if he asked me beforehand what I thought he should provide.

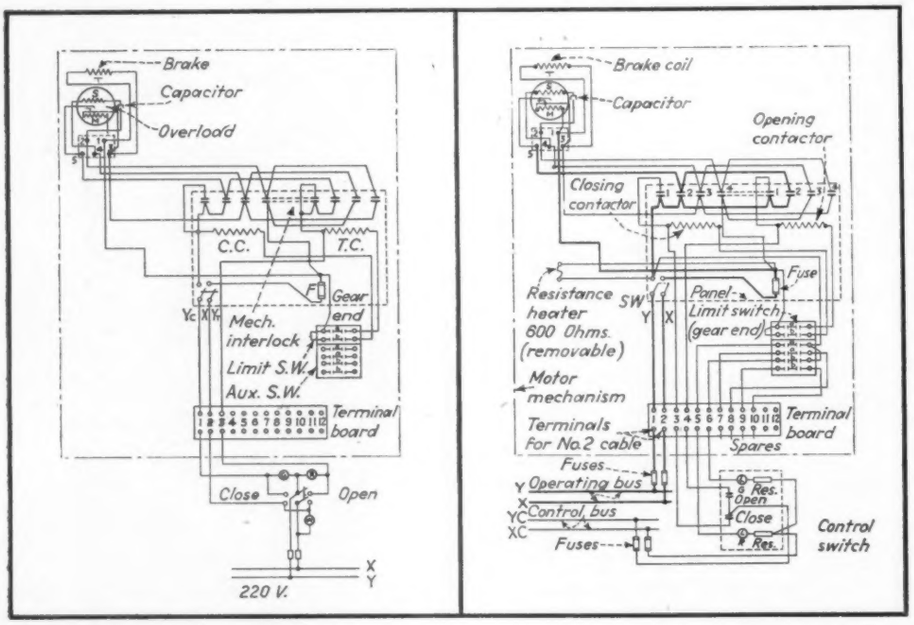
*This series began in the May 16, 1942, issue of "Electrical World," adapted from author's talk "What the Operator Wants to Know" to Steam Power Division, A.S.M.E., Metropolitan Section, March 25, 1942.

Simplifying Switch Mechanism Control

By JAMES A. MITCHELL
Engineering Department,
Hartford Electric Light Company

With a motor-operated, 110-kv. disconnecting switch mounted several hundred feet across a river from the nearest power supply and control point, it was felt desirable to simplify the control wiring as much as possible in order to reduce the number of connecting wires to a minimum. As originally designed, the motor mechanism and the control site were to be connected by six wires, two for power supply and four for control. However, by a few changes in the wiring of the motor mechanism and the substitution of a double-pole, double-throw control switch for the single-pole, double-throw control switch of the original arrangement it is possible to make the connecting circuit do double duty, with the same wires acting for both functions. This reduced the number of wires required to three and simplified the construction and material supply problem accordingly.

The red, green and white indication lamps serve as a continuous monitor of circuit conditions and give immediate notice of any trouble. When both the main disconnect and control switch are in the closed position, the red indicating lamp is in series with the trip coil, showing that the disconnect is closed and the tripping circuit intact and ready for the next operation. Then if it is desired to open the disconnect, the control switch is thrown to the open position. This puts operating voltage on the trip coil, which closes its contacts and thus applies operating voltage to the motor. At the same time the red light is extinguished, and when the disconnect has completed its travel, the green light is energized through the closing coil and remains lighted as a continuous monitor of the closing circuit. As a safety measure, the control switch can be locked in the center position (closed neither right nor left), and then the white light in series with either the red or green light still maintains the monitor circuit.



WIRING SCHEME for three-wire remote control of 110-kv. disconnecting switch

SUPERSEDED six-wire control scheme

G, R and *W* represent green, red and white signal lamps; *CC* and *TC* are closing and tripping contactors, respectively. Motor and operating pipe turn *clockwise* to close main switch (looking down on top of mechanism).

YOU'D never know from the outside. The skin is firm, the color good. But on the viewing screen of an X-ray unit—an electronic device with a multitude of uses—appears a mottled image. Presto! The inspector discards the substandard fruit.

And other G-E electronic devices today are saving time and material, reducing production cost in war work . . .

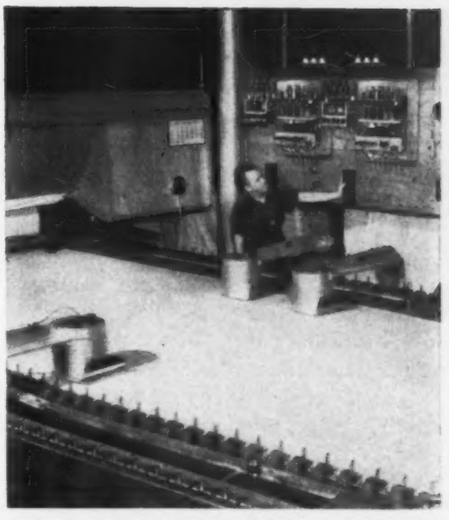
In aircraft factories, G-E electronic welding control reduces fabrication time of some parts—often by more than 50%.

Machine tools equipped with G.E.'s new, electronic motor control—Thy-mo-trol—now maintain their maximum production speed automatically. You get d-c speed flexibility *from a-c lines;* eliminate time-consuming or bulky speed-changing devices; conserve vital materials.

In rolling mills, steel strip is electronically inspected for pinholes as small as 1/100 inch in diameter *at 750 feet per minute.*

There is scarcely an industrial plant where a G-E electronic device cannot in some way bring about faster, more economical production.

A 20-page booklet, "G-E Electronic Devices for Industry" (GES-2411), will give you further information. Contact any G-E office or write to General Electric, Section D 645-20, Schenectady, New York.



Electronic inspectors do hundreds of jobs. Here G-E electric eyes scan the speeding cross-threads in a cloth tenter, detect skew in the cloth, and signal the driving motors to correct the difficulty. This "photo-squared" cloth irons flat, hangs evenly.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment

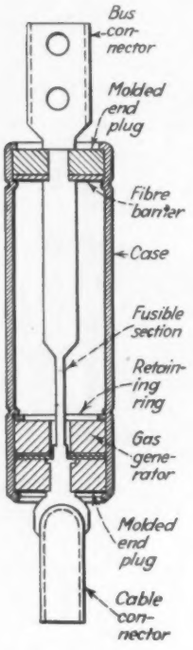
GENERAL ELECTRIC
LEADERSHIP IN ELECTRONICS

A NEW SCIENCE GOES TO WORK FOR INDUSTRY

645-20-8490

Industrial Network Limiter Developed

By J. M. WALLACE
Circuit Breaker Engineer,
Westinghouse Electric & Manufacturing Company



CROSS-SECTION of new 600-volt inclosed limiter

Extension of the network system from 120-208-volt distribution circuits to industrial plant service required the development of a new limiter. The requirements for this service are more severe because of the proximity of operating personnel and increased interrupting duty resulting from higher voltages and shorter cable runs. The totally inclosed limiter developed for this new application embodies new principles of operation. It interrupts fault currents in excess of 50,000 amp. at 600 volts without perceptible noise or visible demonstration.

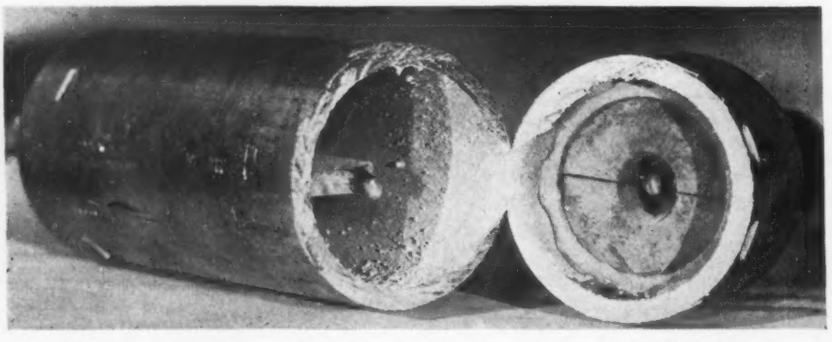
The design of a totally inclosed limiter of the required small size presented the dilemma usually associated with engineering problems. On one hand, the device must have five times the interrupting ability of a cartridge fuse of equivalent current rating and, on the other hand, not only must it be made smaller, but the demonstration attendant to circuit interruption must be eliminated.

The design was accomplished by solving two problems: First, the metallic vapors from the heavy fusible element had to be accommodated. Tests revealed that a copper sheath or cover around the fusible element could supply a condensing surface on which the fused metal would be deposited, thus eliminating high internal pressures. Second, totally inclosed interrupting means had to be provided to insure positive interruption of all currents up to rating. A concentric fibre gas generator which would supply the necessary turbulence to cause deionization of the arc was developed by further testing.

The conducting element is made from a single piece of copper tubing which is flattened and sized to produce the proper fusible element and terminal connectors. The end closure plugs are molded on the conducting element in an extrusion type mold with the retaining ring in place. Split fibre washers are used as barriers to prevent arc flames from burning the molded material and to produce the gas evolving structure. This structure is held in place during the stress of interruption by the retaining ring which fits up snugly against embossed shoulders on the outside casing. A copper tube forms the outside case of the limiter and, in addition, furnishes the condensing surface for the metal vapors caused by the blowing of the fusible section. The entire conducting element is restrained from sliding along the tube by embossing the copper tubing, after which the assembly is sealed by swedging in the ends of the casing. The over-all length of the limiter is 13½ in. The case itself is 2½ in. in diameter and 8 in. long.

Under fault conditions, the fusible section melts and the resulting arc is drawn through the fibre gas generator. The gas blast thereby produced deionizes the arc space to cause circuit interruption. During the arcing period there is a shift in the power factor of the circuit due to the high arc voltage. This characteristic of the limiter is advantageous not only because it aids in circuit interruption, but also because it protects the system from voltage surges at the instant the circuit is interrupted.

The suitability of the limiter for its intended service was demonstrated by voltage tests which were made on blown limiters. In these tests limiters were taken immediately after interruption and placed on overvoltage from terminal to terminal. In all cases the limiter withstood voltages above 2,200 continuously for several days until removed from test.



BLOWN limiter cut open; note fused metal globules condensed on inside surface

•

To Increase Cable Capacity

Facing priority restrictions and shortages of copper, rubber, tin, jute, lead, steel and other important materials ordinarily used in manufacturing insulating wires and cables, the Simplex Wire & Cable Company, Cambridge, Mass., has listed eleven specific measures for increasing the carrying capacity of existing cables, with possibilities of increasing operating efficiency and continuing service for the duration. These are:

1. Use of highest practicable operating voltage.
2. Use of two or more smaller cables in parallel instead of one large cable in certain cases.
3. Improving thermal dissipation conditions.
   (a) By eliminating thermal bottlenecks.
   (b) By forced ventilation.
   (c) By soil wetting.
   (d) By relocation of sources of external heat.
   (e) By cable rerouting.
   (f) By avoiding close grouping of a number of cables and spreading them to dissipate heat.
4. Improving power factor of load.
5. Locating transformers to reduce length of secondary cable.
6. Increasing allowable line drops wherever conditions permit, thus conserving copper.
7. Operating existing circuits at full allowable loadings, reconnecting spare and partially loaded circuits, where possible to accomplish this.
8. Salvaging miscellaneous lengths removed during repair and alterations for reuse at other locations.
9. Using buried cables instead of duct cables where practicable.
10. Using cables exposed in air in preference to cables in conduit where practicable.
11. Selecting cables on a basis of normal operations rather than for occasional overload.

Worried about WPB ORDER L-154?

DEBECOTE

IS A SOLUTION TO YOUR PROBLEM

You need it now more than ever before!

- **PREVENTS CORROSION OF CONDENSER SURFACES**
- **PROTECTS TUBES AGAINST EROSION**
- **USED ON MARINE AND LAND CONDENSERS**

Condenser Tubings Held to 80% Level

Instructions implementing the recent WPB order restricting land surface condenser tubing to Muntz and Admiralty metal (ELECTRICAL WORLD, August 29, 1942, page 7) have been issued to the priorities staff of the power division by Deputy Chief B. J. Sickler.

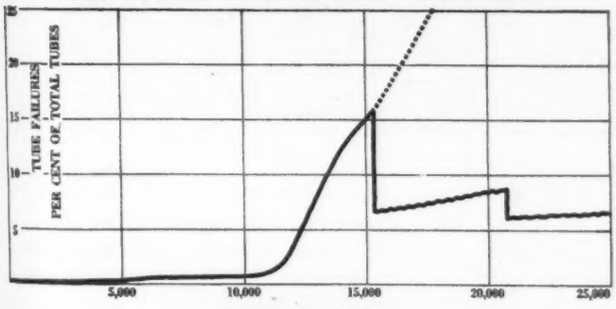
The instructions direct that priorities be granted only for Muntz metal for fresh water service and for Admiralty metal for brackish or salt water service. Where complete retubing is sought the necessity for this step must be "clearly established," and then only 80 percent of the original surface (*i.e.*, number of tubes) may be allowed. Replacement tubing also is to be permitted only where it is established that 80 percent or less of the original surface is serviceable, and the number of replacement tubes permitted is to be limited to 80 percent of the surface.

"Most condensers in service today can be operated with 80 per cent (and in some cases less than 80 percent) of the originally designed surface," Mr. Sickler's instructions state.

The new WPB order restricts the use of copper bearing metal in condenser tubes and tube sheets and emphasizes more than ever the necessity for protection of these surfaces against corrosion, as well as against erosion from air-impingement. This has long been possible with DEBECOTE.

DEBECOTE (a paint-like material) has been expressly developed for coating condenser tubes, tube sheets and water boxes to prevent erosion and corrosion. It is easy to apply, free flowing, rapid drying, applicable to all types of metals, hard when dry, resistant to air impingement, and economical. DEBECOTE has delivered outstanding results on utility power house surface condensers and on marine condensers. DEBECOTE is equally effective for protecting bronze pump impellers.

DEBECOTE IMPROVES TUBE LIFE



The accompanying chart illustrates the dramatic way in which DEBECOTE will work toward the war effort by conserving valuable metal and maintaining power plants at high efficiency. The installation covered by chart was losing tubes so fast that a maximum life of only 20,000 hours was indicated. In a condenser installation on the Atlantic Seaboard, an observation of tube failures revealed that the maximum wear was usually within the first six inches of the inlet end, while the remainder of the tube was in good condition. The solution of the problem was found by coating the inlet ends of the tubes with an erosion-resisting cement. (DEBECOTE)

After 15,300 service hours, all the plugs were removed from the leaking tubes and the inlet ends of both passes were painted. When the condenser was ready for service, the tubes were tested for leaks and it was found that 772 of the 1,317 leaking tubes had been reclaimed for use as a result of coating with DEBECOTE.

The condenser remained in service for 5,600 hours before it was again coated with DEBECOTE. As before, all the plugs were removed and all the tubes coated. On a total of 726 leaking tubes, it was necessary to plug only 534 tubes permanently this time. In this way the life curve has been kept fairly horizontal at about 7.5% plugged tubes of the total installed. This experience has been reconfirmed many times by the experience of other DEBECOTE users during many years.

The use of DEBECOTE is an immediate and effective war-time conservation practice. Specify it for your old and new condenser installations.

Send for your copy of this FREE DATA BOOKLET→

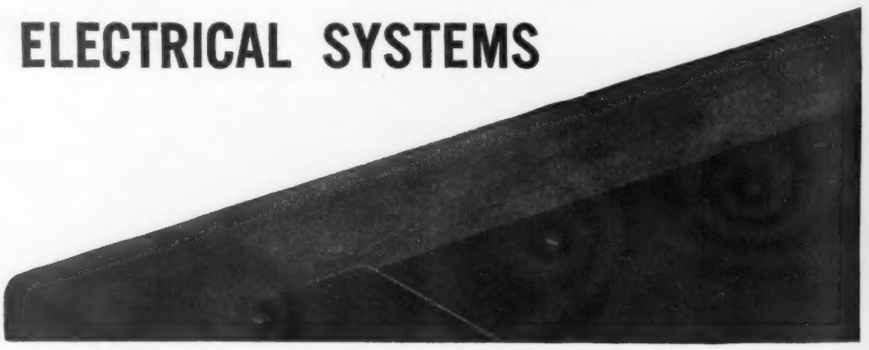
This booklet contains technical data and descriptions of application-technique for DEBECOTE.

THE DEBEVOISE COMPANY

968-978 GRAND STREET, BROOKLYN, NEW YORK

ANACONDA'S PREVENTIVE

TO SAFEGUARD CONTINUOUS PRODUCTION THROUGH PREVENTIVE MAINTENANCE OF ELECTRICAL SYSTEMS



WITH raw materials so critical—copper and rubber especially—replacement of electrical wires and cables is naturally difficult. To help industry protect its electrical systems and at the same time conserve critical materials, Anaconda has developed the Anaconda Preventive Maintenance Plan, designed to *prevent* electrical system failures *before* they develop and thus safeguard production.

The Anaconda PM Plan provides a practical, automatic method for making a complete analysis of electrical circuits and equipment... uncovering potential weaknesses... showing methods for correcting them... and following with periodic check-ups.

In the average plant the plan should require less than an hour a week. It may save scores of production hours—it will cost you nothing. One of its obvious values is that it encourages and assures the regular check-ups and thorough inspections so needed under today's conditions.

If a critical problem arises with no obvious solution, consult our engineering department or field service staff.

NOTE: The Preventive Maintenance Plan will aid your local W.P.B. Branch in making its decision on your request for material required to avert an actual breakdown.

"Tomorrow may be

MAINTENANCE PLAN

Anaconda PREVENTIVE MAINTENANCE Plan on request

ANACONDA

Anaconda's PM Plan contains basic data useful to every maintenance engineer and electrical contractor. Includes charts for keeping a running check on the condition of your plant's electrical system. Will uncover danger spots, every chance for electrical breakdown, in your plant.

And for every potential weakness uncovered, a practical remedy is suggested.

The remedy, if applied in time, can be quite simple, whereas if actual breakdown is permitted to occur, correcting it may be costly and even impossible.

For example, a loose lug, a corroded connection, exposure of cables to excessive heat, chemicals, oil, improper routing of cables . . . all such trouble points are automatically flagged by the Anaconda PM Plan as well as the major dangers.

Mail the coupon below—or bring it to the attention of the proper person in your plant. 42276

too late...do it today"

Anaconda Wire & Cable Company
25 Broadway, New York City

Please send copy of the Anaconda PM Plan including posters, extra check charts, etc.

Individual.....

Company.....

Address.....*City*.....

HOW TO MODERNIZE, INTERCHANGE AND REHABILITATE BUSHINGS*

1. Taped Mushroom Bushing Approximates Gooseneck Type

Old bushings are merely antiquated, not obsolete. Semi-modern mushroom type transformer bushings can be easily modernized to a very favorable surge characteristic (by comparison with the modern gooseneck or over-mounted bushing) by application and extension of varnished cambric tape to a point well within the porcelain and sealing it with a hard compound. Oil siphon gap must be located above oil level and below highest point of the arch formed in the lead. Scarf and remove insulation for 1 in. from one end of both oil-proof and weather-proof insulated cables. Join ends of stranded conductors by copper splicing sleeve. Wipe soldered joint *perfectly smooth.*

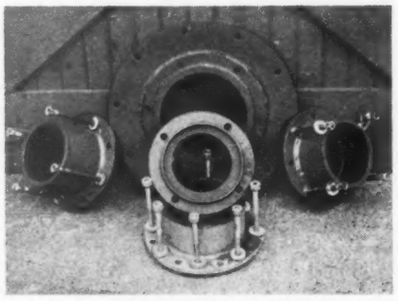
Semi-modern mushroom transformer bushing taped to approximate characteristics of gooseneck type

Saturate joint and scarfed ends of insulation with varnish and fill space between these ends with glyptal tape, using a ¾-in. lap of ¾-in. tape. Avert voids and thoroughly coat each layer with varnish. Taper the tape to extend at least 1 in. inside the porcelain bushing without completely closing the opening in the porcelain. An improperly taped oil-siphon gap has little if any insulating value against surge voltage.

Preheat porcelain bushing to 220 deg. C., insert taped lead and fill bushing with G.E. No. 236 P compound heated to 190-220 deg. Allow assembly to cool naturally without disturbing. Compound heated to a point where it gives off a greenish yellow vapor is too hot and will deteoriate rapidly.

2. Adapter Flanges Aid Bushing Interchange

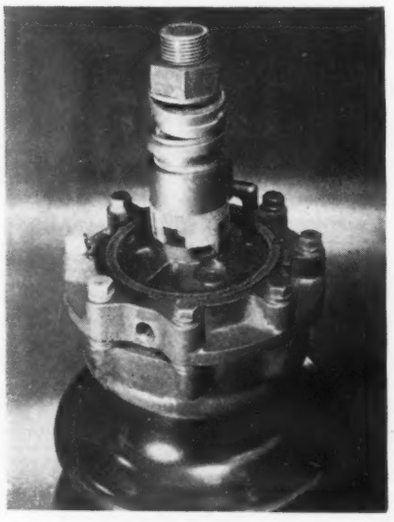
Simple adapter flanges, easily fabricated from salvaged short sections of extra-heavy iron pipe and old boiler plate, permit ready interchangeability between bushings and apparatus of different manufacture. In converting a section of an old delta system to wye operation it is often desirable to improve some of the transformer lead-in insulation by changing pocket type bushings to cover-mounted post type units. Fabricated bushings and hand-hole cover bosses are welded directly to the transformer cover. Old bushing pockets are sealed with pipe plugs, hard compounds, gasketed or welded closing plates, or other simple device.



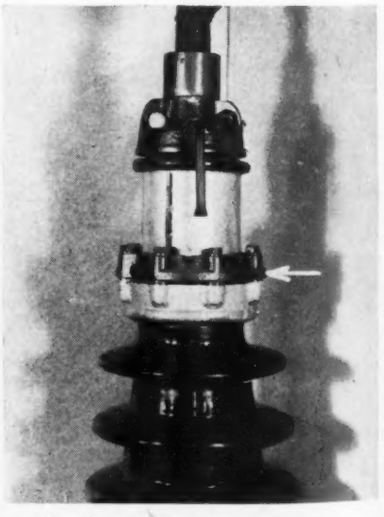
← **Typical assortment of adapter flanges**

3. Sump Washer Drains Water From Oil-Gage

In the case of oil-filled bushing equipment with a clear-glass gage and expansion reservoir. The glass may be painted, leaving only a narrow vertical strip to indicate the oil level; the old straight-mouthed breather may be expanded to simulate the modern bellmouth. This will materially arrest the oil-sludging tendency and glass discoloration and prohibit the entrance of large droplets of water, but it does not prevent moisture condensation within the glass and its transmittal to the active insulations in the bushing center. Here the rehabilitations should be carried further and a sump washer added to the upper terminal assembly, so that condensed moisture can be collected at a harmless point and periodically drained off. The addition of thermo-siphon features is desirable when convenient.



Assembling sump washer and sealing gaskets for oil-filled bushing



Modernized oil-filled bushing with sump washer (see arrow)

*From paper "War on Waste," by L. M. Limpus, Oklahoma Gas & Electric Co., before Mississippi Valley Electric Association.

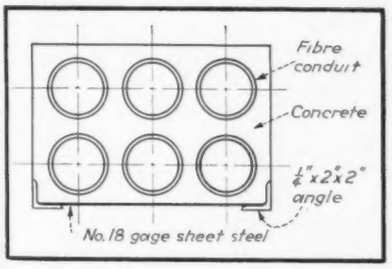
Angle-Frame Bends Cut From Rings

By ARTHUR WANTY
Plant Engineering Dept.
Wisconsin Electric Power Co.
Milwaukee, Wisconsin

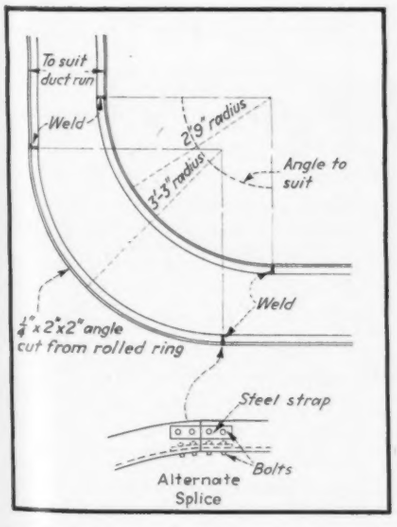
Duct runs carrying power or control cables in a power plant, substation or industrial establishment usually hang from a ceiling or are carried along or down a wall in concrete-incased conduit that is supported in a steel "pan" of the proper width.

These pans are usually made in one of two ways: (1) A sheet steel pan is shop fabricated by bending and forming. Such pans can be used economically but have strength limitations and should not be used to carry excessive weight of cable, conduit and concrete for the span between the supports; (2) a stronger pan is made of two steel angle irons bolted to supports at the required distance apart. Sheet metal is laid between the angles.

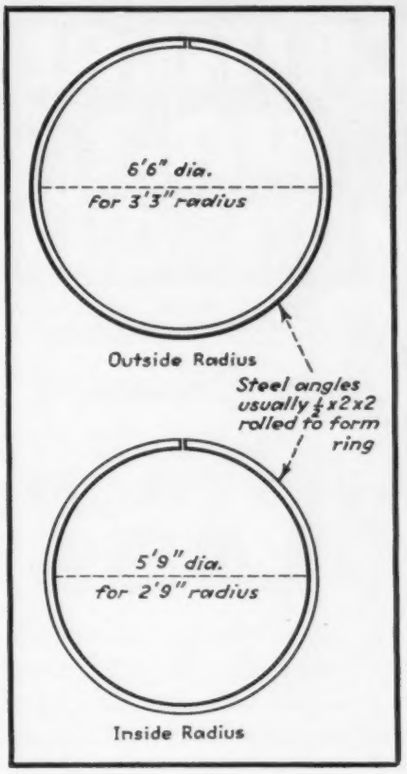
In recent years the second type of pan has been made up entirely in the field. Chief difficulty in field fabrication is in making bends of the desired radius in the angle iron. This has been done by sawing numerous cuts in one leg of the angle iron and bending the other leg. But these saw cuts reduce strength and must be welded to restore original strength.



DUCT RUN section supported by angle frame



ANGLE IRON rolled into rings provide bends of different length



METHOD of attaching bends to straight section of angle frame

Much of this difficulty in making bends can be overcome by ordering rings of steel angles from a shop which has facilities for rolling structural shapes and cutting sections from them to suit the angle of the job. These rings are specified with a radius to suit the standard fiber conduit bends.

In the majority of cases this company uses a 3-ft. 0-in. radius bend. Thus the radius of the outside angle is 3 ft. 3 in. and the inside 2 ft. 9 in.

Where a welder is available, bent sections cut from the ring are butt welded to the straight sections where practicable. Otherwise they can be spliced together, using steel plates as a tie.

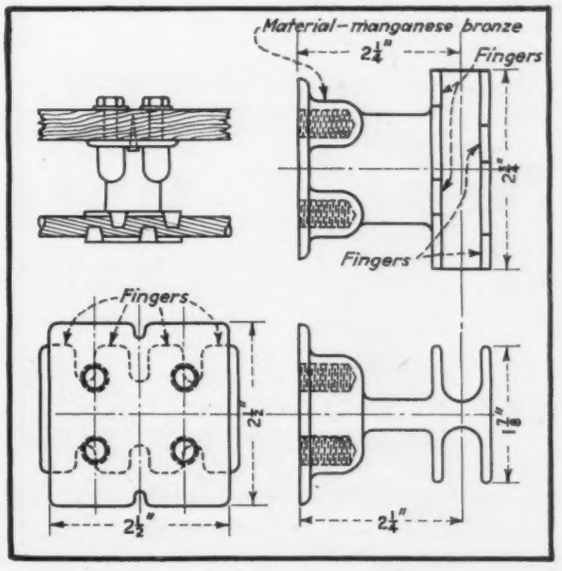
It is believed that this method will result in a more satisfactory job, both in appearance and strength, and can be done more economically than the old method.

•

Special Plate Stops Ground Wire Breakage

Trouble with ground wires breaking off where they emerge from concrete forms during the construction of transformer piers, circuit-breaker and other equipment foundations has been eliminated by the design of a special grounding plate (shown below) by the engineers of the Commonwealth & Southern Corporation, Jackson, Mich.

The grounding plate, of manganese bronze, is cast directly into the surface of the equipment pier or concrete work in the manner shown in the accompanying sketch. The plate is nailed or bolted to the concrete forms prior to pouring concrete and ground wires or buses are inserted between fingers of the plate, which are then bent over and brazed to the ground bus. External connection from ground plate to apparatus is made by bolting copper strap or wire to the surface of the ground plate by means of the four ⅜-in. tapped holes.



DETAIL of bronze grounding plate and method of installation

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USE SILVERED GLASS

Step up your lighting to step up production. Install PERMAFLECTORS, the highly-efficient, silvered-glass reflector that picks up the maximum flux of light and puts it exactly where you need and want it! Over 70 designs, a correct shape for any and every purpose — providing engineered light control, for concentrated, intermediate and broad light distribution. Write for literature.

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In new and remodelled plants, highly efficient general and localized lighting can be quickly, inexpensively secured with surface-mounted or suspended PERMAFLECTORS. Complete. Ready to install. Employ minimum critical war materials. Government-specified and Government-approved.

PICK UP THE WEAK SPOTS in your plant or production-line lighting with special Permaflector "auxiliaries." Decrease spoilage, reduce accidents, increase production.

New 500-WATT FLOODLIGHT

Ideal for all outdoor floodlighting applications. New 500-Watt floodlight is equipped with high-efficiency, silvered-glass PERMAFLECTOR, in any of 3 light distributions – broad, intermediate, concentrated. Rugged. Weatherproof. Rust-resistant. Complete. Ready to install.

PITTSBURGH REFLECTOR CO.

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406 OLIVER BLDG. - PITTSBURGH, PA.

Tear Off

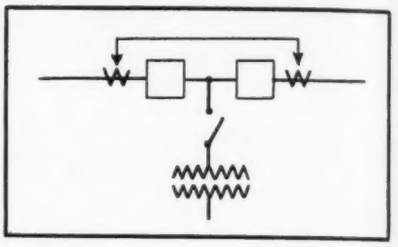
Clip to letterhead. Sign. Mail for complete information, prices.

Bank Breakers Omitted from Loop Tap-off

By G. B. HARVIN

Relay Engineer Carolina Power & Light Co.

Breakers may be omitted on the high side of transformer banks at single-bank stations on a transmission line loop, if the station is equipped with breakers for the line loop and



MERELY a disconnect suffices when breakers protect the loop and tap

occasional opening of the loop at that point does not seriously interfere with system operation. In such case protection for the transformers and back-up protection for feeder breakers on the low side of the transformers can be obtained with differential relaying on the transmission line breakers. A fault between the two breakers will relay both of the high line breakers, and the transformer bank may then be cleared by means of simple disconnecting switches.

This procedure, while not new, is a timely alternative to use of oil circuit breaker on the tap bank, now that oil circuit breakers are hard to get.

•

Hand Truck Outfit for Brazing Leads

For brazing on terminals and making other connections in leads of repaired transformers on electric brazing outfit mounted on a hand truck is a time and work saver in the shop of the Georgia Power Company at Atlanta. The truck is the familiar two-wheel kind such as used in handling boxes and barrels. The transformer to supply the heating current is mounted low down just above the wheels. To the vertical frame of the truck is fixed a track of angle iron in which a crosspiece carrying the brazing jaws is moved up and down by means of a screw with a hand wheel at its top end.

For Severe Conditions

PERMANENTLY INSULATED ROCKBESTOS

One hundred and twenty-two different standard types of *permanently insulated* wire have been developed by Rockbestos—all designed to give better and longer service *under severe operating conditions* in specific applications. They are built to *permanently resist* such wire-destroying hazards as heat and moisture, oil, grease, corrosive fumes and fire. This page shows a few that are widely used in industry. For further information send for our catalog.

RESISTS
Heat — Fire
Corrosive Fumes
Oil — Grease
Moisture

600 VOLT A.V.C. SWITCHBOARD WIRE—TABLE B
(Underwriters' Type AVB)

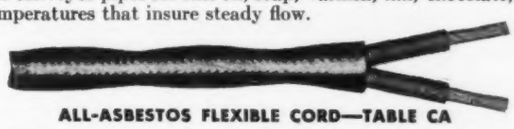
Sizes No. 18 to 4/0 A. W. G. with varnished cambric and felted asbestos insulation and gray, black, white or colored flameproof cotton braid.

Combine fire insurance and fine appearance in your switchboards with Rockbestos Switchboard Wire. It is absolutely fireproof and will not dry out under heat. Sharp, clean bends can be made without cracking as the asbestos wall acts as a cushion under the braid. Rockbestos A. V. C. Hinge Cable and Switchboard Bus Cable have the same fireproof and heatproof characteristics.

INDUSTRIAL HEATING CABLE—TABLE LH

No. 19 A. W. G. nickel-chromium wire insulated with .040" of felted asbestos and covered with 4/64" waterproof lead sheath.

This pliable cable distributes a mild heat evenly over a large area. Prevents freezing of water pipes, wet pipe sprinkler systems, etc. Keeps conveyor pipes for fuel oil, soap, varnish, ink, chocolate, etc., at temperatures that insure steady flow.



ALL-ASBESTOS FLEXIBLE CORD—TABLE CA

Sizes No. 10 to 18 A.W.G. with two or three conductors insulated with felted asbestos, covered with asbestos braid. Also in A.V.C. (asbestos and varnished cambric) constructions.

This heat-resisting flexible cord is ideal for high-wattage lighting units, floodlights, blueprint machines, apparatus, etc., which require a heavy duty, enduring cord. For moisture-resistant construction specify the A. V. C. type. Labeled cord with polarized conductors if desired.

600 VOLT A.V.C. BOILER ROOM WIRE—TABLE C
(Underwriters' Type AVA)

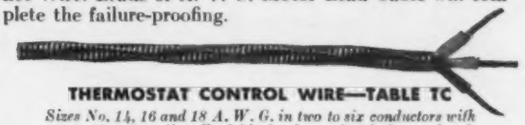
Sizes No. 18 to 4/0 A. W. G. This construction for sizes 18 to 8, sizes 6 to 4/0 have another wall of felted asbestos next to the conductor.

For lighting and control circuits exposed to heat and moisture, oil, grease, corrosive fumes or fire hazard, such as exist around furnaces, ovens, lehrs, soaking pits, boilers, etc., this widely used A. V. C. construction is ideal. Also for locomotive panel wiring and for switchboards requiring an asbestos braided wire.

ASBESTOS INSULATED MAGNET WIRE

Round, square and rectangular asbestos insulated conductors finished to meet varying winding conditions and coil treatment requirements.

Protect your motors against heat-induced breakdowns with class B windings of Rockbestos Heat-Resisting Magnet Wire. Leads of A. V. C. Motor Lead Cable will complete the failure-proofing.



THERMOSTAT CONTROL WIRE—TABLE TC

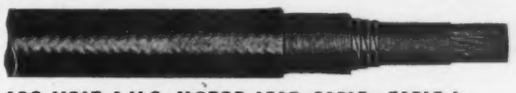
Sizes No. 14, 16 and 18 A. W. G. in two to six conductors with 12¼, 25 or 31 mil wall of felted asbestos insulation and cadmium plated steel armor.

A multi-conductor control wire for low voltage intercommunicating, signal and temperature control systems. Its lifetime insulation and rugged steel armor will give you troubleproof circuits.

600 VOLT ALL-ASBESTOS RHEOSTAT CABLE—TABLE R
(Underwriters' Type AI)

Sizes No. 18 A. W. G. to 1,000,000 CM insulated with a heavy wall of felted asbestos, covered with a rugged asbestos braid finished in black, white or colors.

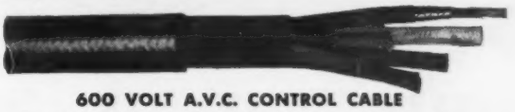
Use this power and rheostat cable for wiring rheostats, switchboards, elevator and locomotive control panels and electrical equipment exposed to heat, fumes and fire hazard. Also for general open wiring in dry, high temperature locations. For solid conductor specify Rockbestos Rheostat Wire, Table A.



600 VOLT A.V.C. MOTOR LEAD CABLE—TABLE L
(Underwriters' Type AVA)

Sizes No. 18 A. W. G. to 1,000,000 CM insulated with two walls of felted asbestos and a high-dielectric, heat-sealed varnished cambric insert, covered with heavy asbestos braid.

Heatproof, fireproof, greaseproof and oilproof, this cable will not dry out and crack, won't burn or carry flame, and will remain permanently flexible. For coil connections, motor and transformer leads where extreme heat and fire hazards are encountered as in steel mills, boiler rooms, etc.



600 VOLT A.V.C. CONTROL CABLE

In one to 19 conductors. Standard stranding A. W. G. No. 12—19/No. 25 and No. 9—19/No. 22. Other strandings furnished.

Designed for use under conditions too severe for control cables with other types of insulation which deteriorate rapidly when exposed to high temperatures. Operates without failure under the attack of heat, oil, grease or corrosive fumes and may be installed in conduit as it has ample moisture resistance.

600 VOLT A.V.C. POWER CABLE—TABLE E
(Underwriters' Type AVA)

Sizes No. 18 A. W. G. to 1,000,000 CM insulated with laminated felted asbestos and varnished cambric, and asbestos braid. Other constructions for service voltages up to 8000.

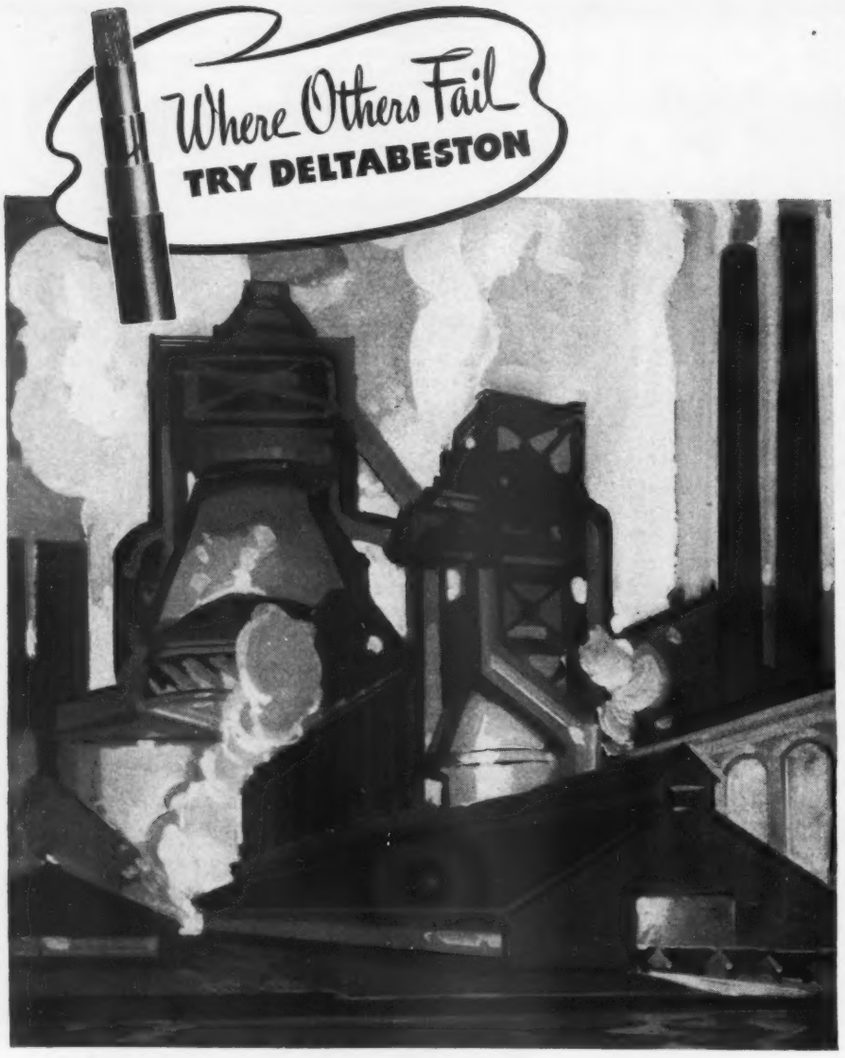
This cable is recommended for power circuits and hot spot wiring in or around boiler rooms, ash pits, steam tunnels, soaking pits, tenter frames, glass plants, steel mills, etc. The asbestos and heat-sealed varnished cambric construction has ample moisture resistance and withstands high temperatures indefinitely.

ROCKBESTOS PRODUCTS CORP.
866 Nicoll Street, New Haven, Conn.

122 STANDARD TYPES

ROCKBESTOS

The Wire with Permanent Insulation



When the Heat's On....

That's when it pays to have Deltabeston Wires and Cables in your industrial equipment. Heat . . . humidity . . . and deterioration don't have a chance to upset production schedules or cause costly repairs.

Deltabeston is moisture-proof, flame-proof and durable. It is built to stand peak load operations, day after day, and will give safe, uninterrupted service. Don't take chances with ordinary insulations when the "heat is on." Put in Deltabeston for protection.

Deltabeston and Glass Insulated Cables are distributed nationally by Graybar Electric Co., G-E Supply Corp. and other G-E Merchandise Distributors. For complete information get in touch with your nearest Distributor or write to Section Y1022-9, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

In operation the truck is wheeled up to the work, the jaws adjusted to the proper height by means of the hand wheel and screw then clamped on the terminal and the current is turned on to supply the brazing heat.

•

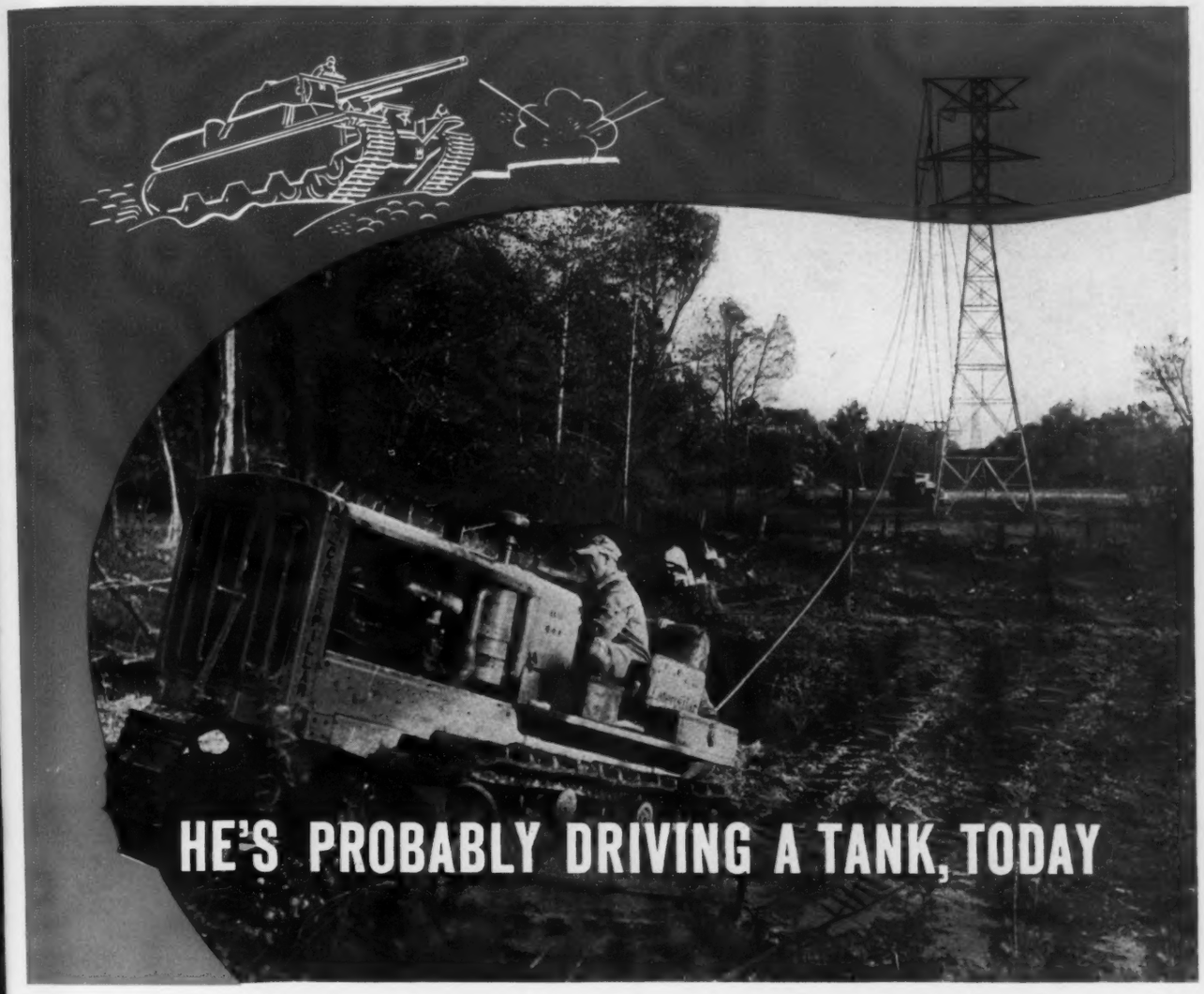
Inductive and Dielectric Heating*

Inductive heating can be roughly segregated by frequency into three classes. The first class covers application to 1,000 cycles. It is almost entirely used for forging and melting steel and non-ferrous metals either directly or indirectly (*i.e.*, by heating electrically conductive crucibles). Power requirements range from a few watts to thousands of kilowatts supplied by motor-generator sets. It is being widely used to produce many of the specialized alloys demanded for war equipment.

The second class covers frequencies from 1,000 to 12,000 cycles almost entirely generated by rotating machines with power ratings of from 20 to 1,200 kw. The applications in this group cover practically all heating processes — surface hardening, forging, brazing, soldering, melting are all included. One to three thousand cycles are used for melting nonferrous alloys, for surface hardening relatively large parts and for some forging applications. The new 9,600-cycle generators are being used successfully for surface hardening relatively small parts where the contours need not be too closely followed and where the depth of case need not be too small. Widely used for brazing and soldering of other high resistance metals, it is more difficult to apply to the heating of copper, brass and other low resistance alloys.

The third group of inductive heating covers all applications from 50,000 cycles to 1,000,000 cycles. Generation is almost entirely restricted to spark gap and vacuum tube oscillators. Spark gap type of equipment can be built for frequencies from 50,000 cycles to 200,000 cycles and for power outputs up to 25 kw. Vacuum tube equipment, although having no theoretical frequency or power limitation, is most

*Abridged from paper "Application of Vacuum Tube Oscillators to Inductive and Dielectric Heating in Industry," by J. P. Jordan, General Electric Co., presented at A.I.E.E. 1942 Pacific Coast convention.



No land battleship could be maneuvered more cleverly than the way he handled this cable-stringing "cat." The skill with which he snaked the bull ropes through swamps, up hill and down, speeded erection of this important line. Today, this line is backing him up, carrying power to vital war-production plants.

The Government has ruled that power lines—rural or hi-lines—are to have wire and fittings needed to keep them on the job. Ruling P-46 permits you to obtain the proper materials for their maintenance.

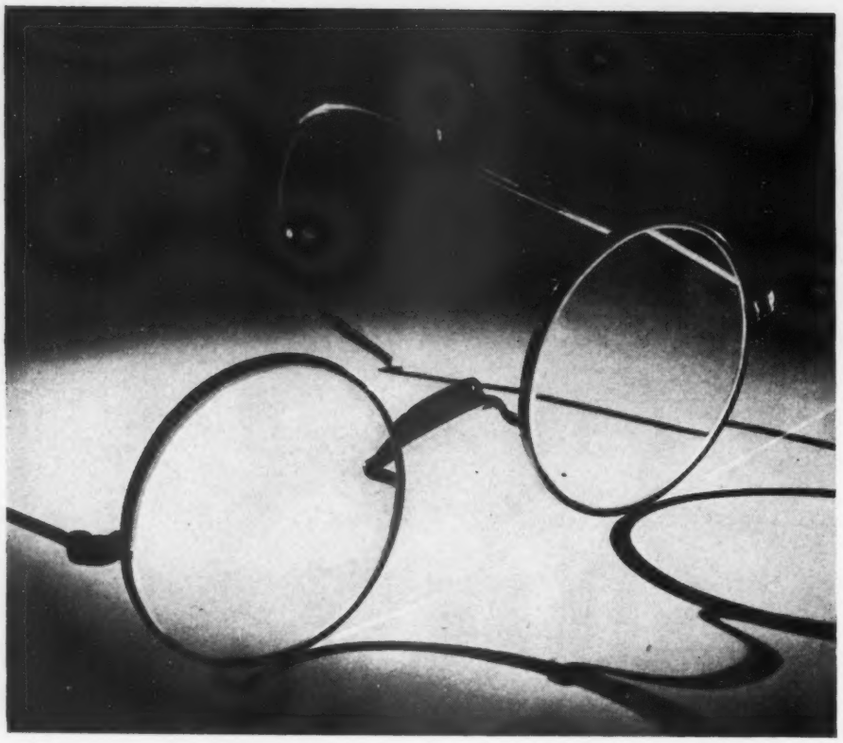
If it's engineering help you're needing, Alcoa engineers are available to give you that, too. Write ALUMINUM COMPANY OF AMERICA, 2138 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

A.C.S.R.

A·C·S·R *Aluminum Cable Steel Reinforced*

ON RURAL POWER LINES AND HI-LINES



There will be FEWER OF THESE

Eyeglasses symbolize eyestrain. By reducing eyestrain through proper lighting, your war production can be increased both in quantity and quality. Fewer man-hours will be lost, fewer rejects will come off your production lines.

Silv-A-King offers a complete lighting service—fine equipment (either fluorescent or incandescent) plus skillful engineering to lay out your lighting installation for maximum effectiveness. Our ability to serve you well in lighting comes from 21 years of experience as industrial lighting specialists. A Silv-A-King lighting engineer is at your call wherever you are located.

Bright Light Reflector Company, Inc.,
1035 Metropolitan Avenue, Brooklyn, N. Y.

Write for new, 16-page Silv-A-King book:
"Light Is An Essential Production Tool"

A Few Typical Silv-A-King Users:
AC SPARK PLUG
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JONES & LAUGHLIN STEEL
PITTSBURGH PLATE GLASS
and many others

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SILV-A-KING
EQUIPMENT

SILV-A-KING MAKES *Light* WORK FOR YOU

economically applied at frequencies over 150,000 cycles and at power outputs up to 200 kw.

The majority of steel parts can be readily surface hardened at the intermediate frequencies by heating the surface inductively and quenching when the desired penetration has been achieved. Much higher frequencies are required for irregular parts where the contour must be followed closely, where coupling is difficult due to shape or small size and where extreme localization of the heat is a necessity. Readily to heat the low resistance metals such as silver, copper, aluminum, and brass the magnetic flux densities required at the intermediate frequencies are difficult to obtain, whereas the higher frequencies allow the use of more normal flux densities.

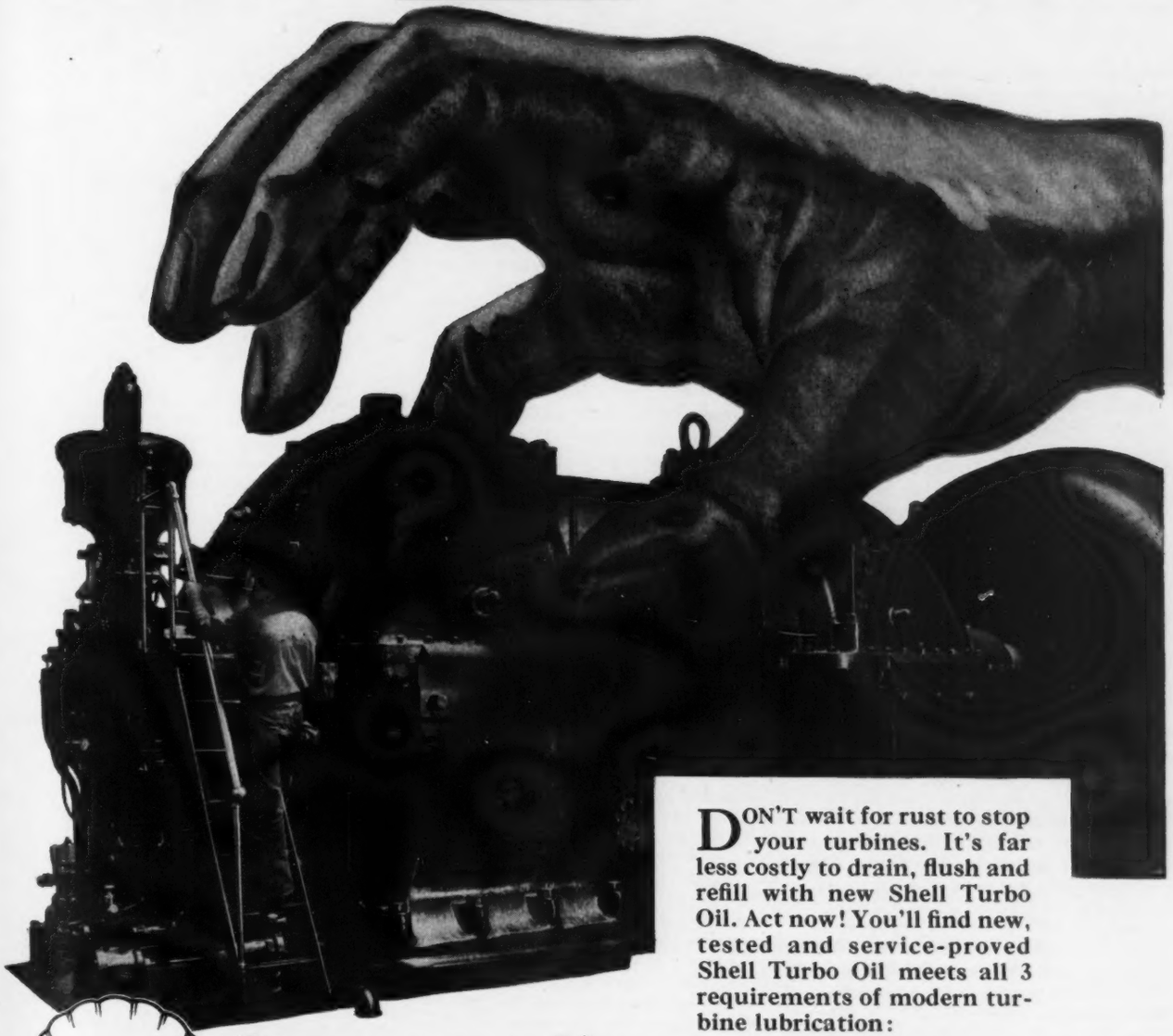
In the dielectric heating field the vacuum tube oscillator is the only source capable of producing sufficient power at the frequencies necessary. From 1 million to 30 million cycles have been used at powers up to 200 kw.

In dielectric heating the material to be heated is placed between two electrodes and voltage applied at a frequency above one million cycles. The whole forms a high-loss capacitor. The theory of dielectric losses is somewhat complex and is not yet thoroughly understood. However for most materials the heat developed is roughly proportional to the frequency and voltage applied, and to the power factor of the dielectric. The entire mass is uniformly heated throughout, provided the electric field is uniform.

Dielectric heating of non-conducting materials is the newest application in the field and shows great promise of rapid development. Already one large unit has been placed in operation curing the glue in plywood with promise of many other such installations. Several unsuccessful trials have been made to cure rubber by this method, but the applications to plastics, ceramics, and insulating compounds is progressing.

Not only will this type of heating reduce the time of curing of many plastic parts (a reduction in the case of thick laminated plastic insulating compounds of from hours to minutes), but it will allow the use of some types of plastics in forms previously impossible because of the difficulty of properly curing the material.

RUST CLOSING IN ON YOUR TURBINES?



DON'T wait for rust to stop your turbines. It's far less costly to drain, flush and refill with new Shell Turbo Oil. Act now! You'll find new, tested and service-proved Shell Turbo Oil meets all 3 requirements of modern turbine lubrication:

RUST PREVENTION
SUPERIOR OXIDATION STABILITY
MINIMUM FOAMING TENDENCY

Don't accept less! Call in Shell now!

SHELL

Protect your turbines with RUST-PREVENTIVE

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HOW* TO HANDLE LINE AND EQUIPMENT CLEARANCES—I

OFFICIAL CLEARANCE LIST

The Official clearance list contains lists of all men who are authorized to take clearances on the Alabama Power Company System. It is understood that all men whose names appear on this list, except as otherwise specified in the list, are familiar with the general instructions and are fully capable of doing *line switching* under the direction of the proper load dispatcher or operator. Switching at primary substations and generating plants will be performed *only by those men regularly assigned to such duties.*

MEANING OF CLEARANCE

Clearance on a certain line or piece of apparatus indicates that the line or apparatus is entirely disconnected from all sources of potential and that air-break or disconnect switches controlling such sources of potential are *held open* according to the orders of the dispatcher or operator controlling the line or apparatus. *There must be an open air-break switch or open disconnect switches between the line or apparatus and all possible sources of potential.*

PROCEDURE OF CLEARANCE

In taking lines or apparatus out of service for clearance, the following procedure shall be enforced: *The man in charge of work,* in order to obtain proper clearance, shall call the dispatcher or operator (referred to as dispatcher in the following) in charge of line or apparatus, defining exactly what he wishes out of service, why and for how long. The dispatcher, after making the necessary arrangements, shall take the line or apparatus out of service, making sure that it cannot be energized from any source, by opening and tagging proper disconnects or air-break switches and making a record of the operation on the proper form. The dispatcher shall then advise *the man in charge of work* that the line or apparatus is dead and properly tagged under his name. When the work is finished *the man who received clearance* shall advise the dispatcher that his work is completed, all grounds off, all men clear, and line or apparatus is ready to be placed in service. Hold tags should then be removed and, if normal, line or apparatus placed in service. Always caution parties requesting clearance on any particular hazardous condition that you may know of.

ALL POSSIBLE SOURCES

In issuing switching orders for clearing line or apparatus, switches controlling all possible sources of potential must be opened and tagged. For instance, some transformer banks have a possible feed back due to customers' generating equipment, railway signal circuits, low-tension distribution systems, etc. Low-tension bank switches in such cases must be opened and tagged as well as high-tension switches.

ALL AFFECTED EQUIPMENT

Clearance should be requested on *each and every piece of equipment required for the safe execution of the work to be done.* For example, at numerous places on the system line potential transformers, which are connected through individual fuses directly on the line side of the oil circuit breaker disconnects, are located so close to the circuit breaker that it is hazardous to work on either the circuit breaker or potential transformer without securing clearance on both. It is very important, therefore, for the man in charge of the work in such a case to request clearance on both the circuit breaker and potential transformer. The load dispatcher, on the other hand, should thoroughly question all parties requesting clearance in regard to the nature of the work and proximity of other equipment to make certain that the clearance given is adequate for the work to be performed.

MECHANICALLY BLOCKED

Gang-operated or motor-operated disconnect and air-break switches must be mechanically or electrically blocked in the open position and checked to see that all blades are open when they control circuits or equipment upon which clearance is to be issued. When a dispatcher orders a switch "opened and tagged" the operator should open the switch, open the motor circuit (if motor-operated), check the position of each blade and mechanically lock or block the switch in the open position. After the operator has completed the switching order, the dispatcher should ascertain from the operator if he is positive that all blades are open and that all switches are mechanically locked or blocked open.

IF NO DIRECT COMMUNICATION

In the event it is necessary to issue clearance on some line or apparatus and direct communication is not possible with the person desiring clearance, then clearance must be issued to some operator with whom the person can communicate. The operator, in turn, will issue clearance to the person who originally desired the clearance. After completion of work, the person holding clearance will release his clearance to the operator, who in turn will release his clearance to the load dispatcher or operator controls the line or apparatus.

NECESSARY LINE CUTTING

Sometimes it becomes necessary actually to cut a line in two at one or more points, for maintenance or construction work, due to the lack of proper sectionalizing switches. When this becomes necessary the division superintendent shall designate the number of the pole or structure where the line is to be cut and shall notify the operator or dispatcher who is responsible for switching on the line involved of the exact location of such pole or structure. The operator or dispatcher will then give clearance on that section of line cut out to the properly authorized foreman or lineman who is to do the work. In making out the regular hold cards to cover such cases the operator or dispatcher shall then use the pole number or structure number in the same manner as switch numbers are used.

MORE THAN ONE CREW

When two or more crews are working on the same line or apparatus at the same or different locations, each crew must secure its own clearance in the usual manner and the foreman of each crew must make sure that the line or apparatus is properly grounded.

CLEARANCE REQUESTS, TRANSFERS, ISSUANCES

Requests for clearance will be considered in the order in which received and in the order of importance so as to interfere as little as possible with normal system operation.

Transfer of clearance may be arranged as follows: *The man holding clearance* reports to the proper dispatcher or operator that he wishes to transfer his clearance to another, giving name of party. *The party to whom the clearance* is to be transferred should obtain clearance in the regular manner. The first party should then release his clearance in the regular manner.

Clearances shall be issued only to properly authorized persons whose names appear on the official clearance list.

*According to system operating procedures of the Alabama Power Company

Breaker Maintenance Based on Operations

Frequency of maintenance operations on oil circuit breakers is determined by two considerations. One is judgment as to the period of time that may be allowed between routine overhauls and tests. The other is the number of operations that can be permitted before a breaker needs attention. Data on both of these considerations should be and usually are kept on the record cards of breaker maintenance.

AUTOMATIC OPERATIONS					
1	2	3	4	5	6
7	8	9	10	11	12
1	2	3	4	5	6
7	8	9	10	11	12
1	2	3	4	5	6
7	8	9	10	11	12
1	2	3	4	5	6
7	8	9	10	11	12
1	2	3	4	5	6
7	8	9	10	11	12
1	2	3	4	5	6
7	8	9	10	11	12
1	2	3	4	5	6
7	8	9	10	11	12
1	2	3	4	5	6
7	8	9	10	11	12
1	2	3	4	5	6
7	8	9	10	11	12
1	2	3	4	5	6
7	8	9	10	11	12
1	2	3	4	5	6
7	8	9	10	11	12

OPERATIONS RECORD for breaker maintenance card

The calendar routine of maintenance can be satisfactorily carried on by a call-up system by which cards pop out of the file to show what breakers are up for attention next. But there is no calendar regularity about the needs for attention resulting from breaker operations and some other means than periodic call-up is necessary.

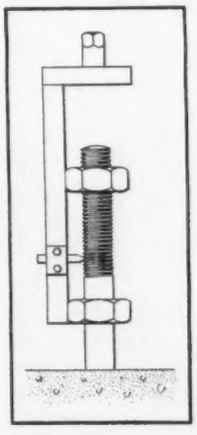
This problem is nicely disposed of by the maintenance record card of a Southeastern utility. A panel of the form illustrated is printed on the card. It is judged that the breaker recorded by the card can be allowed eight operations and then should be overhauled. In the first series of numerals the figure eight is checked with a red pencil. Then every time the breaker functions a black check is made against the proper figure below eight. When the figures through seven have then been checked off the clerk knows that an order for overhaul is due at the time of the next operation.

It may happen that overhaul according to the calendar will intervene before the number of permitted operations is reached. If so, the figure of permitted operations is checked in the next series of numerals. If overhaul is done according to number of operations before the calendar period has elapsed, then the next period is started on the date of overhaul.

•

Foundation Studs Threaded Down

By one of those errors that sometimes happen, the studs set into a concrete base to serve as a machine foundation were found to be too long in the shank. The threads did not go down far enough to hold the machine. This was in a station of the Georgia Power Company, where R. L. Wood is master mechanic, a situation made to order for the ingenuity of Mr. Wood. The studs were 2½ in. in diameter, pretty heavy steel. They could not be replaced with others of proper length without breaking up the concrete base, not so good. The master mechanic set to work and made a tool jig as shown in the sketch at right. The jig was made of a piece of heavy steel bar to which a reamed-out nut was welded at one end and at the other a short arm carrying a stud to which a compressed air motor with a gear reduction could be attached. About in the middle of the bar was welded another nut, this one with the threads left in it. Just above the lower nut a clamp was fixed to hold the cutting tool. The jig was run down on the stud by the air motor, the tool making a cut as it descended. Another cut and then some more and the stud was threaded down properly. Then the stud was cut off to the right length.



TOOL for threading down studs set to high

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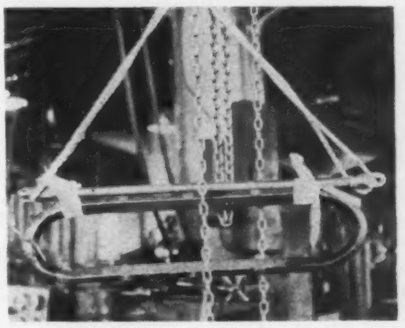
Speeds Rewinding of Regulator Rotors

"It used to take several days to get the coils back into the slots of a regulator rotor," said O. J. Harrington, shop foreman of the Portland General Electric Company, Portland, Ore. "We pried away at them with sticks, used wedges, pounded, and in every other way we could think of attempted to spring the coils and force them into the slots. Sometimes the insulation of a coil would get damaged and would have to be repaired. Then we would start all over again on the tedious job of getting it into place. Then we hit upon an idea that now enables us to put on the coils with comparative ease and we can now put on a whole set of rotor coils in half a day."



"STRADDLE BUG" spreads coil to facilitate replacement in slots

The accompanying picture shows how they do it. The rotor, which was not included in the picture, is mounted on two horses below this rig, with the shaft horizontal, the rotor being so anchored that it cannot be lifted by a vertical pull.

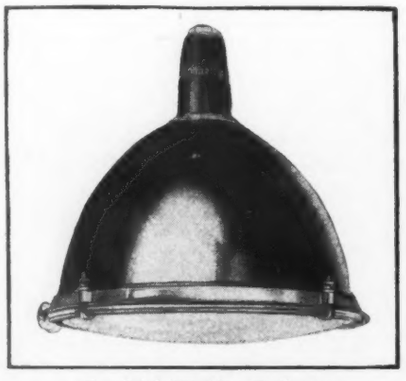
The shop "straddle bug," carrying a chain hoist, is then run over the rotor. To the hoist hook is hung the rig shown, consisting of a short length of ¾-in. pipe, fitted on the ends with ¾-in. clevises taken from a hand-operated oil switch. Rope is passed

WHAT!! Beat the Axis with REFLECTORS?

OF COURSE, it takes planes, tanks, and guns to win a war. But in the plants that make these things, *light* is considered the important factor in speeding eyes and hands, reducing errors, assisting precision workmanship. Hence, reflectors are playing a vital role in helping to defeat the Axis.

Protecting vital plants with floodlighting—saving man-hours in production—Goodrich Industrial Fixtures are serving America's war effort everywhere.

To get more weapons to our fighting men *faster*, new Goodrich developments in industrial lighting help keep war production at top speed with such modern fixtures as the Highlite Reflector. This high mounting porcelain enameled fixture provides abundant illumination for large industrial interiors without glare or shadow to interfere with comfortable vision. Catalog sheets on request.



Goodrich Highlite Reflector

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH ELECTRIC COMPANY

OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4626 BELLE PLAINE AVENUE, CHICAGO, ILL.

through the clevises and fastened to the hoist hook above.

From the pipe is suspended one of the coils by means of 1½-in. stay binding around both pipe and top side of coil, near the ends so as not to interfere with the seating of the coil in the slot. The number of turns of binding depends on the pull required.

The hoist is then lowered until the lower side of the coil can be slipped into the lowest groove in the stator. The hoist then has all the power necessary to spring the coil so that the upper half will drop readily into the upper slot.

•

British Find Plywoods Electrically Useful

Plywoods, of current American interest because of their recent utilization in aircraft manufacture, have also found useful electrical uses in Great Britain, according to the *Electrical Review*. Such materials are very strong, in addition to being good electrical insulators, resist corrosion and acid as well as moisture absorption. Those produced under greatest pressure with the largest resin impregnation content—55 percent—appear to afford best results.

British engineers have found that they can be substituted for metals, being more suitable (one-sixth the weight of structural steel) in some cases, easier to machine and modify and more quickly produced in a variety of thicknesses and shapes. Earliest electrical uses included phase-barriers and tank linings in oil circuit breakers, where they were chosen because of lightness combined with rigidity. Little insulation value is necessary for such physical separators, it is pointed out, since they naturally assume the dielectric strength of the switch oil in which they are immersed.

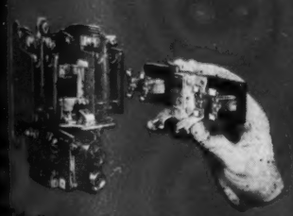
Two Varieties

Two recent varieties, both produced hot under pressure, are known by the trade names of "Jabroc" and "Insul-Jabroc." The first is made up of alternate laminations of wood veneers and glue films and is primarily for mechanical superiority when electrical stressing is slight. The dielectrically better second form consists

MISTER, we keep 'em Clean!

Keeping things shipshape is an unending job in the navy . . . for dust settles on horizontal surfaces everywhere whether these surfaces are parts of a boat far at sea or parts inside motor control in any factory.

Because dust *is* found in even the most unexpected places, it is not surprising to find it *inside* Motor Control equipment in any busy factory. Cutler-Hammer engineers recognized this . . . and they also knew that dusty, dirty contacts meant trouble . . . so they designed their famous VERTICAL contact Motor Control. *Vertical* contacts simply can't collect dust and dirt. They *stay* clean to work better and last longer. Such Motor Control that needs less attention and sets records for dependable performance in these days and nights of continuous high-speed production contributes not only to industrial efficiency but directly to national security. CUTLER-HAMMER, Inc., 1285 St. Paul Ave., Milwaukee, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto.



Cutler-Hammer Vertical Contacts are the result of better Motor Control, another extra dividend on Cutler-Hammer's unequalled specialized experience and decades of Motor Control leadership.

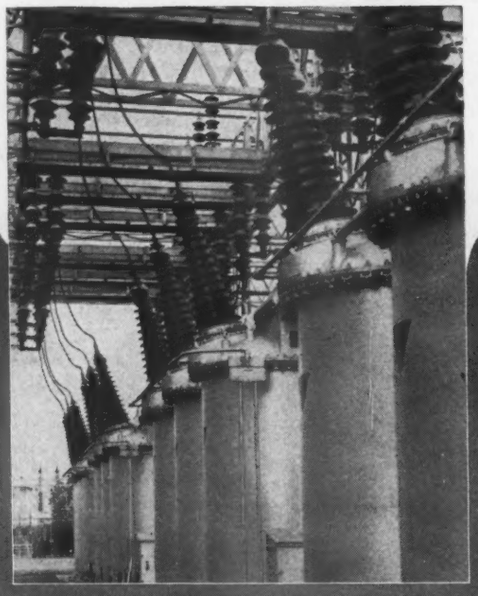
CUTLER-HAMMER
MOTOR CONTROL
C-H

1892-1942 50th ANNIVERSARY

Dust Safe VERTICAL *Contacts*

Copyright 1942, Cutler-Hammer, Inc.

BOMBS OR SABOTEURS MAY NEVER REACH YOU... BUT ARE YOU *Ready?*



THE MASTER OF FLAME

duGas Fire Extinguishing Apparatus

Kills Fires in Seconds...Cuts Priceless Time from the Extinguishing Period

Where sudden, extra-hazardous fires endanger lives, valuable equipment, and threaten to halt the flow of vital power, *speed* is all important. Every second lost in killing a dangerous fire can mean hours and days lost in national Victory production.

DuGas—providing certain, *ready* protection and sure, *swift*, fighting action—is particularly effective on fires involving electrical equipment and fires in highly inflammable oils. DuGas stands guard today for utilities* in many parts of the nation.

** Names on Request*

duGas

DUGAS ENGINEERING CORPORATION • MARINETTE, WISCONSIN

Owned and operated by
ANSUL CHEMICAL COMPANY

Represented in
Principal Cities

DUGAS FIRE EXTINGUISHING APPARATUS IS APPROVED BY UNDERWRITERS' LABORATORIES, FACTORY MUTUAL LABORATORIES

of impregnated veneers only and is essentially for use indoors and outdoors, or under oil. Varying types of veneers—birch, beech, mahogany, poplar, spruce, etc.—are utilized to secure different results.

Plywoods can have tensile strengths up to 34,000 lb. per sq.in., with compressive strengths between 18,000 and 30,000 lb. per sq.in., depending on veneer orientation with respect to the direction of the grain of the wood. Fanwise arrangement of the veneer laminations is suited to the manufacture of circular articles, with 45-deg. stacking as a simplification. The simplest possible formation—all laminations and grain directions placed parallel to each other—is also the best for producing articles that will be subjected to bending and tension stresses.

Standard tests of the electrical puncture strength of "Insul-Jabroc"—one minute at 35 kv.—on two 0.25-in. boards selected at random, each consisting of 21 veneers of beechwood, resulted in puncture at 65 kv. when the material was impregnated with cresol resin and at 62.5 kv. when phenol resin was used.

An interesting application is insulator pins for overhead lines. Normally, steel pins are used because of the considerable side loading to which they are subjected by wind and ice formation. However, the unfavorable electrostatic field concentration set up by the metal in pin-type insulators gives rise to many disturbances—including radio noises—in fog and bad weather. With wood pins better distribution of electrical stresses over the porcelain insulators results. One such pin successfully withstood test loads of 400 lb. without appreciable permanent set.

•

Correction

An error has been detected in the article "Estimating Charts for 60-Cycle Line Design," by G. D. McCann, in the February 21, 1942, issue of ELECTRICAL WORLD. In the caption for Fig. 4 (on page 57) it is stated that Figs. 4a and 4b are both on the basis of 5 percent loss. Actually, Fig. 4b is on the basis of 10 percent loss. This same error was carried over, it is reported, in the corresponding treatment in the subsequently published book, "Electrical Transmission

Regular MAINTENANCE of INSULATED WIRES AND CABLES HELPS CABLE PERFORMANCE

★ Insulated cables usually are purchased under specifications that provide for conductors, insulation and protection suitable and adequate for the service they are intended for. Satisfactory service then depends largely upon installation and maintenance. Careful handling, proper equipment and good workmanship will overcome most hazards of installation.

★ Proper design by experienced cable engineers, careful installation under expert supervision, followed by regular inspection and testing, are the best guarantees of satisfactory cable service. But, for the duration of the war, maintenance of cables already in service becomes the major factor in cable operation because new cables are difficult to get and most cable users have no spare cables to install.

★ Careful maintenance is vitally necessary if insulated wires and cables are to continue to function satisfactorily. Regular inspections at frequent intervals, to make sure nothing has happened or is developing to interfere with service, are a good investment. Prompt correction of any unsatisfactory condition will head off complaints and prevent cable failure.

★ In a recent folder entitled "Wire & Cable Maintenance and Conservation of Critical Materials" are a few suggestions designed to aid in keeping insulated wires and cables operating efficiently during the period when copper, rubber and other scarce materials can be used only for war orders and essential industries. We shall be pleased to send a copy to you if you are interested.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

Simplex WIRES and CABLES

FEDERAL

THE NEW FEDERAL CATALOG

— *just off the press!*

. . . and it's yours for the asking.

This new 68 page, illustrated 2-color catalog is designed to provide a quick, ready reference to help you in the selection of the proper switch or panelboard or circuit breaker for every use.

You will find it a valuable source book. For it contains a complete listing of specifications and list prices of the Federal line *plus* a wealth of useful additional information—Allowable Increased Horsepower Rating, Number of Conductors in Conduit, Wiring Data for Motors. And you will find in it a simplified numerical cross-index to make comparisons easy.

Write for your copy now! You're sure to find it a handy, time-saving aid.

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54 PARIS STREET • NEWARK, N. J.

PANELBOARDS • SAFETY SWITCHES
SWITCHBOARDS • CIRCUIT BREAKERS

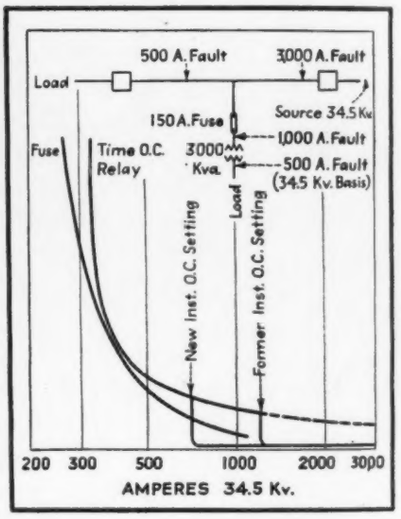
and Distribution Reference Book" of Westinghouse Electric & Manufacturing Company.

•

Relays Set For Fused Banks

By V. D. HOLLIS
Operating Department, Central Illinois Public Service Company, Springfield

Where a relatively large transformer, protected by highside fuses, is connected near the source end of a transmission line, the relays at that end may have excessively long time delay for faults farther along the line if they are set to co-ordinate with the



NEW instantaneous relay setting extends faster protection from 1,200-700 amp. on circuits supplying fused transformer banks

fuses on the large transformer. The accompanying diagram shows a typical case.

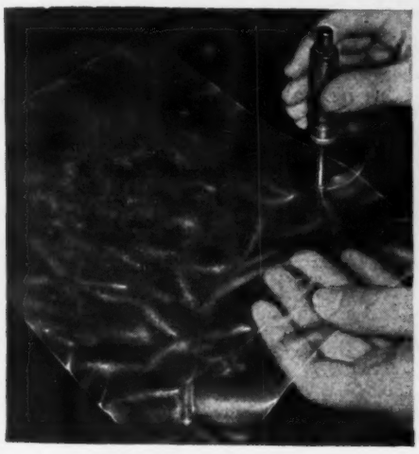
If new relays cannot be installed to overcome this time delay, a great improvement in over-all protection often will be secured by resetting the relays so that the fuse will melt for a fault at the transformer bushing in the time required for the relay plus the clearing time of its circuit breaker. This compromise will be justified if the probability of a fault in the few feet of bus between the fuse and the transformer is small compared with the probability of a transmission line fault. It may further be justified by the serious effects of time delay at high fault current on more important parts of the system connected to the same source.

THREE INSULATING ALTERNATES FOR VARNISHED SILK!

Every electrical insulation need, formerly provided by varnished silk, can now be met with one of Irvington's three new alternates.

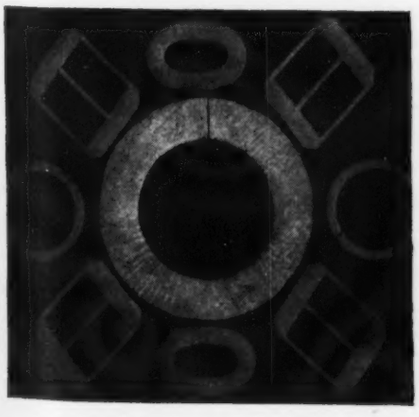
●VARNISHED RAYON ●VARNISHED COTTON CLOTH ●VARNISHED NYLON

All these materials possess good dielectric strength with tensile and tear strengths equal to or better than varnished silk. They are available in thicknesses from .003" to .008". Each base material is coated with IRVINGTON special insulating varnish.



VARNISHED RAYON is the most suitable alternate for varnished silk that has yet been found. High-tenacity varnished rayon is as strong as silk and just as flexible. It is comparable to varnished silk in cost. This insulation has a dielectric strength of 1200 VPM and has been used for wrapping leads, small magnetos and coils.

VARNISHED COTTON CLOTH has much greater tensile strength than varnished silk. Its pliability allows application on odd shapes Dielectric strength of this insulation is 1200 VPM



VARNISHED NYLON possesses the qualities of both flexibility and high tensile strength with dielectric strength of 1200 VPM. All the alternates for silk, like Varnished Nylon above, can be punched into special shapes.

Irvington's three alternates for silk are available in black or yellow; straight-cut rolls or bias-cut strips in 51" lengths.

Let us know your requirements

We will recommend the best material for your needs. Write Department 46

IRVINGTON

VARNISH & INSULATOR CO.

IRVINGTON, NEW JERSEY, U.S.A.

PLANTS AT IRVINGTON, N. J. and HAMILTON, ONT., CAN.

Representatives in 20 Principal Cities

LOAD SERVICING

Industrial • Commercial • Rural • Residential

Postcards Save Gas, Tires on "Skips"*

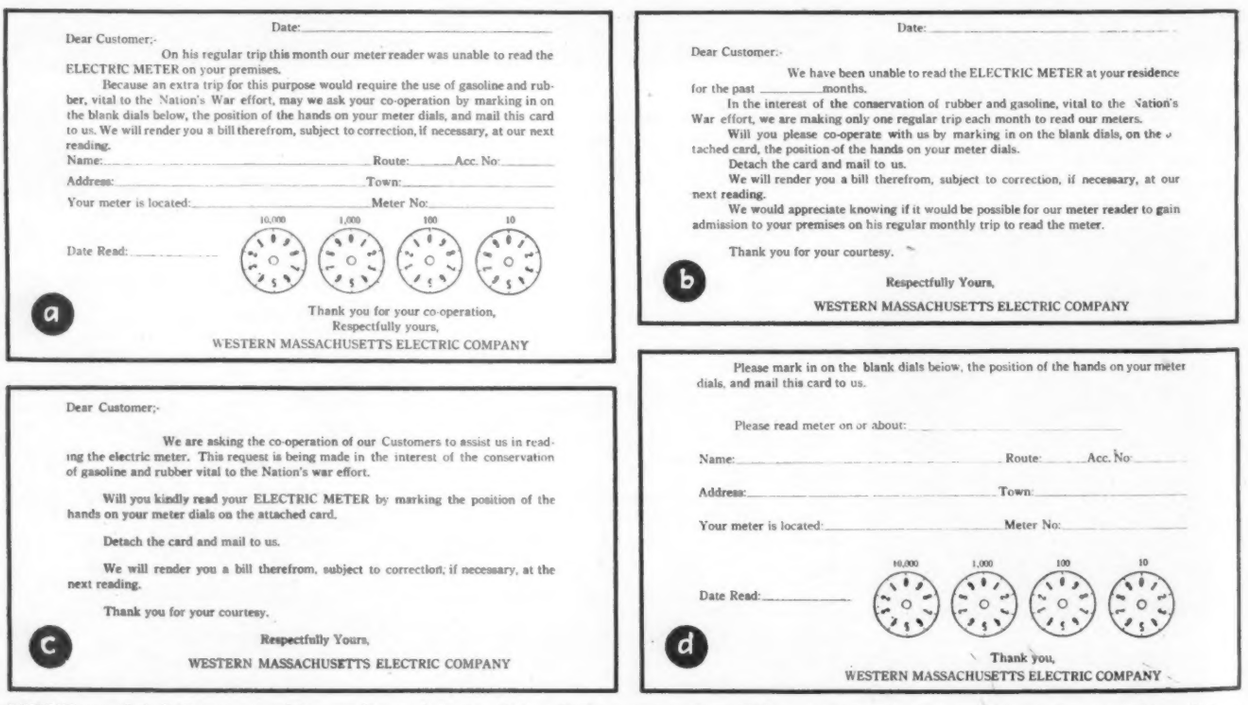
Substantial economies in automobile mileage have been attained in the Greenfield area served by the Western Massachusetts Electric Company through the use of return postcards in connection with skipped meter readings. Formerly in this district one man with a car read meters in the remote and rural areas and picked up skip readings of other meter readers who preceded him. Return postcards were left by this special reader when he could not obtain the skip reading in person. The results were so good that the company established a more comprehensive procedure.

Superseding the previous practice, the meter reader now leaves a card on all "skips" other than demand and industrial accounts on the first and only meter reading trip for the month. Before leaving the card he writes the customer's meter and route numbers on the card to assist the customer in reading the correct meter. The reader then writes the word "card" on the meter reading page for that month, showing that a card was left for the customer to fill out and mail to the utility. When the card arrives with a reading, the meter reading clerk erases the word "card" from the reading space and enters the meter reading from the card.

If meters are skipped two months in succession and the word "card" appears in the meter reading space (showing that the card left the previous month was not returned), the meter reader does not leave a second card, but when the route book is returned to the meter department to be checked, a list is made of the two months' skips, and return postcards are mailed to those customers, requesting them to read their meters.

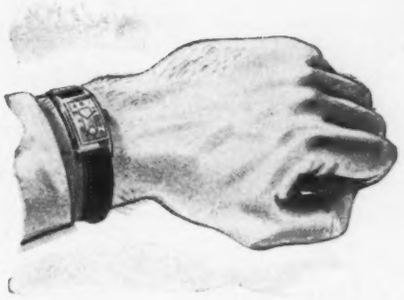
This method of obtaining skip readings was tried out for a month, using the regular postcards, where no mention was made as to the conservation of gasoline and rubber, and 80 percent of the cards left were returned

*From a paper before the New England Association of Meter Engineers by Stanley M. Gould, Superintendent of Meters, Western Massachusetts Electric Co.


Date:
Dear Customer:-
On his regular trip this month our meter reader was unable to read the ELECTRIC METER on your premises.
Because an extra trip for this purpose would require the use of gasoline and rubber, vital to the Nation's War effort, may we ask your co-operation by marking in on the blank dials below, the position of the hands on your meter dials, and mail this card to us. We will render you a bill therefrom, subject to correction, if necessary, at our next reading.
Name: Route: Acc. No:
Address: Town:
Your meter is located: Meter No:
10,000 1,000 100 10
Date Read:
Thank you for your co-operation,
Respectfully yours,
WESTERN MASSACHUSETTS ELECTRIC COMPANY
a
Date:
Dear Customer:-
We have been unable to read the ELECTKIC METER at your residence for the past months.
In the interest of the conservation of rubber and gasoline, vital to the Nation's War effort, we are making only one regular trip each month to read our meters.
Will you please co-operate with us by marking in on the blank dials, on the attached card, the position of the hands on your meter dials.
Detach the card and mail to us.
We will render you a bill therefrom, subject to correction, if necessary, at our next reading.
We would appreciate knowing if it would be possible for our meter reader to gain admission to your premises on his regular monthly trip to read the meter.
Thank you for your courtesy.
Respectfully Yours,
WESTERN MASSACHUSETTS ELECTRIC COMPANY
b
Dear Customer;-
We are asking the co-operation of our Customers to assist us in reading the electric meter. This request is being made in the interest of the conservation of gasoline and rubber vital to the Nation's war effort.
Will you kindly read your ELECTRIC METER by marking the position of the hands on your meter dials on the attached card.
Detach the card and mail to us.
We will render you a bill therefrom, subject to correction, if necessary, at the next reading.
Thank you for your courtesy.
Respectfully Yours,
WESTERN MASSACHUSETTS ELECTRIC COMPANY
c
Please mark in on the blank dials below, the position of the hands on your meter dials, and mail this card to us.
Please read meter on or about:
Name: Route: Acc. No:
Address: Town:
Your meter is located: Meter No:
10,000 1,000 100 10
Date Read:
Thank you,
WESTERN MASSACHUSETTS ELECTRIC COMPANY
d

INITIAL card left to cover skip reading of meter (a). Follow-up card mailed customer where a meter reading is skipped two months in succession (b). Card mailed to customers in remote areas with request for co-operation in meter reading (c) by return of dial hand position indications to utility meter department (d)

The last hour of the War



NO MAN KNOWS when the last hour of the war will come. But it will come sooner as war production is increased tonight and tomorrow and tomorrow. If this isn't so, then all talk of production is folly.

Ending the war sooner—pulling the end closer to us even by an hour—can mean life or death to thousands.

In one hour a machine gun can spit out over 10,000 bullets. In one hour an anti-aircraft gun can fire over 1000 shells.

In one hour a battleship can deliver more than 500 tons of armor-piercing steel over 14 miles.

In one hour a group of 1,000 bombers can drop 2,000 tons of bombs, badly damaging a city the size of Cleveland or St. Louis or Los Angeles or even Philadelphia or Chicago.

Every hour of the war is important—but ending the war even one hour sooner can be your goal, and ours. No one knows exactly what happened in World War I, in that last hour between ten and eleven A.M. on November 11th. But throughout the morning of November 11th, according to the casualty lists published in the New York Times, 1,021 American boys were either killed in action or seriously wounded.

And the tempo of this War, compared with World War I, is like a tropical hurricane compared with a March wind.

So when we help break a production bottleneck, help speed production with better light, we have a right to feel that we are helping end the war seconds sooner. And any one of us, who by his own efforts quickens necessary production to the tune of 100,000 man hours in a year, can rightfully hope that he may be helping end the war by even one hour.

Tonight and tomorrow—the hours we put in speeding production are the most important hours in our service to our country. They may be the most important hours in our personal lives.

Perhaps someone you knew and loved was killed on the morning of November 11th, 1918. Perhaps someone you know and love will remain alive in the last hour of this war, because you did what you could tonight and tomorrow!

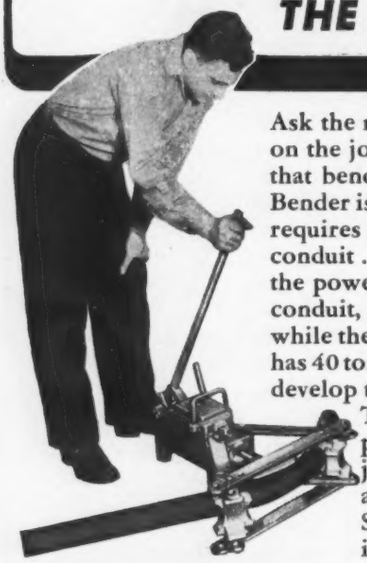
G-E MAZDA LAMPS

GENERAL ELECTRIC

General Electric offers you the services of its lighting engineers as well as a complete plan to help your industrial customers speed production—and so end the war sooner. See your local General Electric Lamp Division office or write General Electric Company, Department 166-E0-J-1, Nela Park, Cleveland, Ohio.

GREENLEE BENDERS

EASIER AND FASTER FOR THE MAN ON THE JOB



Ask the man who knows . . . the operator right out on the job doing the bending . . . and he'll tell you that bending conduit with the Greenlee Hydraulic Bender is even easier than it looks. To bend conduit requires power . . . approximately 31 tons for 4-inch conduit . . . and Greenlee Hydraulic Benders have the power. The No. 770 Bender, for 1¼ to 3-inch conduit, has 25 tons of easily developed power, while the No. 775 Bender, for 3 to 4½-inch conduit, has 40 tons of hydraulic power. One man can quickly develop this power by simply pumping the handles. These light, portable benders are built compactly into one unit, are easily carried to the jobs and set up, and will not move and twist about when in use. Our Bender Booklet S-116 will show you how you can cut bending costs on every job.

Greenlee No. 770 Bender

Send for BENDER BULLETIN S-116

GREENLEE TOOL CO.

1810 COLUMBIA AVE., ROCKFORD, ILL.

PAGE FENCE

America's First Wire Fence — Since 1883

GUARDIAN OF POWER UNITS ESSENTIAL TO VICTORY

● Production time is now more precious than ever before. Power units must be protected against shut-downs caused by hostile trespassers. Safeguarding power properties has been a major function of sturdy Page Fence since J. Wallace Page originated woven wire fence in 1883, and founded the company which has been a leader in important fence developments. Safeguarding the fence investment through localized, responsible engineering and erecting service is also a Page achievement. More than 100 factory-trained, long-experienced local firms which own their own plants, make up the PAGE FENCE ASSOCIATION, Headquarters: Monessen, Pennsylvania.

VICTORY FIRST
At the Page mills, men, machines and materials are on an all-out schedule for production of fence to protect plants working on Government orders

PRODUCT OF PAGE STEEL & WIRE DIVISION — AMERICAN CHAIN & CABLE COMPANY, INC., BRIDGEPORT, CONN.

with correct readings. There was a saving of 350 car-miles (1,018 to 668 car-miles drop).

The next month 597 No. 1 cards were left by the meter reader and 468 of these were returned (78 percent). Because of missed skip readings 59 No. 2 cards were mailed by the company and 33 (56 percent) of these were returned. The total car-mileage for the month was 298.

In order that customers living in remote and rural areas may assist in meter readings, a return postcard is prepared for them in the meter department office by typing in the name, address, route, account number, meter number, etc. These are mailed to reach the customer on or about the regular reading date, in accordance with the reading schedule. These cards are mailed for two months for the customer to fill out, and the third month the meter reader, with the car, reads them according to the regular schedule.

In one month's use of this card 1,114 were mailed and 538 were read on the date requested, 435 more being read within one week of the requested date. Of these 1,114 cards, 995 were returned (89 percent). During the two months no skips were read by motor car, and buses were used wherever possible.

The company is considering the use of bi-monthly meter readings to seek further economies, and particularly to meet the problems arising from diminishing labor supply due to the war effort.

•

Banked Units Light Dental Surgery

By FLOYD SELL
Lighting Sales Division, Detroit Edison Co.

The lighting system illustrated was designed for Dr. M. W. Prince, of Detroit, Mich., to eliminate the undesirable features of conventional lighting fixtures used by dentists. These are:

1. Excessive glare in the eyes of the patient, causing discomfort.
2. Inconvenience to the doctor in adjusting spotlight to obtain proper illumination in the mouth.
3. Excessive heat from the light source, resulting in discomfort to both patient and doctor.
4. Shadows cast by the doctor's hands and head.
5. Insufficient general illumination for the

2 TOOLS for Greater Speed in WAR MATERIAL PRODUCTION

BALANCED LIGHTING *for* **BETTER SEEING ON THE JOB**

INFRA-RED PROCESS *for* **BETTER BAKING AND DRYING**

More Output THRU "SEEING" SPEED

To America's millions of war workers, balanced lighting is a vital tool for increased production output. Eyes see quicker—hands move faster, more accurately—with better light for "seeing" on each vital job. In the airplane part machining operation pictured above, a Fostoria Localite furnishes the needed high intensity lighting directed on the work area for speedy, comfortable "seeing". Combined with the lower intensity of general plant lighting, "seeing" conditions for the worker are in proper balance to promote his maximum efficiency with minimum fatigue. Do your plant workers have this needed production help? Request a Fostoria analysis, today.

More Output THRU DRYING SPEED

Amazing reductions in time for baking, drying, preheating and dehydrating operations are obtained with the Infra-red Process. The above picture shows how one manufacturer bakes the insulating varnish on armatures in only 55 minutes on a production basis. The same Infra-red tunnel is also used to bake the finish coat on armature housings. Hundreds of war industries, from Jeeps to gas mask buckles, are cutting drying time from hours to minutes by utilizing Fostoria Infra-red equipment. Request case studies applicable to your product, today. Fostoria technical service provides full cooperation in adapting this time-saving process to your requirements.

For Counsel on Lighting and Drying Problems

THE FOSTORIA PRESSED STEEL CORPORATION, FOSTORIA, OHIO

Fostoria Products Manufactured and Distributed in Canada by Amalgamated Electric Corp., Ltd., Toronto, Canada

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ATLANTA, GA.
The John A. Dodd Company
299 Techwood Dr., N.W. Phone: Jackson 1695

BALA-CYNWYD, PA.
The J. V. Calhoun Company
349 Montgomery Ave.
Phone: Greenwood 4477 at Phila.

BIRMINGHAM, ALA.
National Distributors, Inc.
1925 Fifth Ave., N. . . . Phone: 3-6259, 3-6250

BOSTON, MASS.
Fostoria Engineering Service
(Div. of Copley Sales Co.)
620 Commonwealth Ave., Phone: Com. 0333

BRIDGEPORT, CONN.
Sprague Electrical Supplies, Inc.
777 Main Street . . . . . Phone: 4-2141

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Fostoria Industrial Service
(Div. of Wipperman & Mitchell, Inc.)
424 N. Oak St. . . . . Phone: Lafayette 8135

CHARLESTON, W. VA.
Charleston Electrical Supply Company
Phone: 26-157

CHARLOTTE, N. C.
Mill Power Supply Company
300 W. 1st St. . . . . Phone: 6134-6137

CHATTANOOGA, TENN.
Fostoria Industrial Service
(Div. of Harry W. Cameron, Inc.)
1021 Chestnut St. . . . . Phone: 6-6194-5

CHICAGO, ILL.
Fostoria Engineering Service
(Div. of Hyre Electric Co.)
741 W. Jackson Blvd. Phone: Haym'k't 8130

CINCINNATI, OHIO
Fostoria Industrial Service
(Div. of Harrison Tire & Rubber Co.)
Court & Race Sts. . . . Phone: Parkway 2080

CLEVELAND, OHIO
Fostoria Industrial Service
4500 Euclid Ave. . . . . Phone: Endicott 6622

COLUMBUS, OHIO
Electric Power Equipment Company
57 E. Chestnut St. . . . . Phone: Adams 5215

DALLAS, TEXAS
The Folsom Company
509 Elm St. . . . . Phone: Riverside 9803

DETROIT, MICH.
Fostoria Engineering Service
2615 12th St. . . . . Phone: Cadillac 0043-44

FINDLAY, OHIO
Fostoria Industrial Service
(Div. of Bearing & Transmission Co.)
211 N. Main St. . . . . Phone: Main 755

FT. WAYNE, IND.
National Mill Supply Company
207 E. Columbia St. . . Phone: Anthony 2331

HARTFORD, CONN.
Electrical Supplies, Inc.
320 Ann St. . . . . Phone: 7-7111

INDIANAPOLIS, IND.
Fostoria Industrial Service
548 Massachusetts Ave. . Phone: R. I. 2934

KANSAS CITY, MO.
Fostoria Industrial Service
Mfgrs. Exch. Bldg. . . . . Phone: Vic. 0770

LOS ANGELES, CALIF.
Fostoria Industrial Service
(Div. of Machinists' Tool & Supply Co.)
3690 Santa Fe Ave. . . . . Phone: Jef. 6294
Fostoria Industrial Engineering Service
(Div. of Quality Electric Co., Ltd.)
1235 E. Olympic Blvd. . . Phone: Trin. 5981
Fostoria Industrial Service
(Div. of Leo J. Meyberg Co.)
2027 S. Figueroa St. . . . . Phone: Pr. 6011

LOUISVILLE, KY.
Pickrell & Craig Co., Inc.
209 E. Main St. . . . . Phone: Jackson 5331

MILWAUKEE, WISC.
Fostoria Engineering Service
104 E. Mason St. . . . . Phone: Daly 2949

MINNEAPOLIS, MINN.
Fostoria Industrial Service
(Div. of W. M. Cotie & Associates)
2 Foshay Tower . . . . Phone: Atlantic 7363

NEW ORLEANS, LA.
Electric Appliance Company
500 Camp St. . . . . Phone: Raymond 7151

NEW YORK, N. Y.
Fostoria Industrial Service of N. Y.
92 Warren Street . . . Phone: Worth 2-3352

NORFOLK, VA.
Fluorescent Light Company, Inc.
857-65 West 44th St. . . . . Phone: 38092

OAKLAND, CALIF.
Fostoria Industrial Service
(Div. of Pacific Electric Motor Company)
10th & Oak Sts. . . . Phone: Glencourt 1844

OMAHA, NEBR.
Fostoria Industrial Service
1107 Farnam St. . . . . Phone: AT. 5543

PITTSBURGH, PA.
Fostoria Industrial Service
7133 Frankstown Ave. . . . . Phone: Fr. 0100

PHILADELPHIA, PA.
(see Bala-Cynwyd)

PORTLAND, OREGON
Fostoria Industrial Service
(Div. of Ken R. Humke Company)
207 N. W. 14th St. . . . . Phone: Atwater 7233

ROCKFORD, ILL.
Fostoria Industrial Service
510 Walnut St. . . . . Phone: Blackhawk 850

ST. LOUIS, MO.
Fostoria Industrial Service
1706 Olive St. . . . . Phone: Central 0153

SAN FRANCISCO, CALIF.
Fostoria Industrial Service
(Div. of Leo J. Meyberg Co.)
70 Tenth St. . . . . Phone: Underhill 1212

SEATTLE, WASH.
Fostoria Industrial Service
(Div. of David Y. Robinson)
1915 First Ave., S. . . . . Phone: Main 0919

SPOKANE, WASH.
Fostoria Industrial Service
(Div. of Hotchkiss & Gilkey Company)
1224 W. 1st Ave. . . . . Phone: Main 2411

TOLEDO, OHIO
Fostoria Industrial Service
(Div. of Bearing & Transmission Co.)
2144 Madison Ave. . . . Phone: Garfield 4302

SAVE THE POLES

● The Sturd-E exclusive Multipoint Cant Hook speeds up pole handling and saves the poles—its six quarter-inch by half-inch points grip much more firmly than a single point—in addition, they do not penetrate the creosote treatment. Result—no deep stab wounds where water collects and rot can start.

Made in three sizes for handling all poles—from the smallest to the big ones 22 inches in diameter. Every utility that has tested the Multipoint Cant Hook has reordered in ever increasing numbers—it saves poles, time, and cost.

STURD E TOOLS
a TRUE TEMPER PRODUCT

STURD E TOOLS

MULTIPOINT CANT HOOK

6 points, ¼" x ½" in size grip the pole securely but leave no deep hole to encourage rot and decay. Points renewable when worn. Furnished in small, medium and large sizes for handling poles up to 22" in diameter. Prices and complete description on request.

Distributed by
JOSLYN MFG. & SUPPLY COMPANY
Executive Offices
20 North Wacker Drive • Chicago, Illinois
Branches and Warehouses with Complete Stocks in Principal Cities of the United States

SIXTEEN 40-watt F-lamps in eight banked, industrial type porcelain enamel reflectors light operating area in dental surgery

Foot-candles at headrest = 175
Room area, 9 x 9 ft. = 81 sq. ft.
Wattage, including reactors = (16 x 40) + (16 x 15.5) = 764
Wattage per square feet of flooor area = $\frac{764}{81} = 9.4$
Foot-candles per watt, per square foot = 18.6

---

doctor, causing eye fatigue. This is experienced when he looks up from his work in the patient's mouth to change instruments, etc.

6. Improper color of light, making necessary the use of daylight for all precise color matching of teeth, dentures and fillings.

An established illumination of 175 ft.-candles at the headrest is provided by 16 fluorescent tubes, 40-watt size, 3,500 deg. white. These are mounted in two-lamp industrial type, porcelain-enamel reflectors. The whole system is supported on a prefabricated framework of 1½-in. "T" iron suspended from the ceiling just far enough to allow removal of reflectors in case of trouble. All lamps are controlled by one switch.

Excessive glare was avoided by keeping everything in the patient's field of view within a tolerable brightness contrast. Spotlight adjustment was eliminated by providing a fixed light source giving adequate illumination in the mouth. Elimination of heat was accomplished by using a fluorescent light source and keeping it remote from the field of operation. Shadows cast by the doctor's hand and head were practically eliminated with the light coming from such a large area. The effect was similar to that produced by a skylight. Adequate general illumination was provided by use of reflectors having a diffuse reflecting surface. All color-matching requirements were fulfilled, allowing completion of the work by day or night.

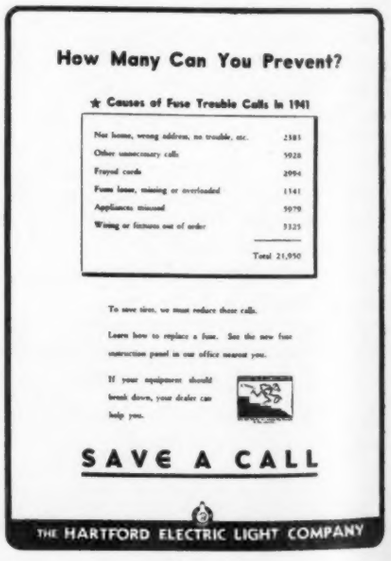
The installation has been in service approximately a year and a half. The dentist is satisfied completely with its performance.

•

To Cut Needless Service Calls

Hartford Electric Light Company has analyzed the causes of 21,950 fuse trouble calls on its system in 1941, with the result that 8,311 were found unnecessary, or 38 percent. In addition, 5,979 calls were due to abuse or misuse of appliances. Every 24 minutes of the year one of these fuse trouble calls was received. To encourage customers to co-operate in saving of tires on company vehicles needed for trouble call service, the accompanying advertisement was recently run in the local press.

In common with many other utilities, the company has set up instruction panels in its various offices to demonstrate the simplicity of fuse replacement by the public. The downward trend in rates for Hartford residential service is stressed in the company's recently advertising, along with the value of dealer service in case of equipment failure.


How Many Can You Prevent?
★ Causes of Fuse Trouble Calls in 1941
Not home, wrong address, no trouble, etc. 2381
Other unnecessary calls 5928
Frayed cords 2094
Fuses loose, missing or overloaded 1141
Appliances misused 5979
Wiring or fixtures out of order 3325
Total 21,950
To save tires, we must reduce these calls.
Learn how to replace a fuse. See the new fuse instruction panel in our office nearest you.
If your equipment should break down, your dealer can help you.
SAVE A CALL
THE HARTFORD ELECTRIC LIGHT COMPANY

Now!

RLM CERTIFIED

Non-Metallic

FLUORESCENT REFLECTORS

● Yes, metal-conserving industrial fluorescent lighting units will now be available with the RLM LABEL . . . certified by Electrical Testing Laboratories to meet rigid RLM Specifications... carrying the same 90-day minimum guarantee heretofore available on other RLM Units.

These new, non-metallic Fluorescent Reflectors are built to rigid specifications developed by the Institute, and based upon studies and tests conducted by the engineering laboratories of various RLM manufacturers. Rigid and continuous inspection and testing by Electrical Testing Laboratories assures conformity to RLM Specifications by all manufacturers authorized to supply RLM Certified non-metallic reflectors with RLM Labeled fluorescent industrial units.

For full particulars on RLM Fluorescent Non-Metallic Reflector Specifications, write any manufacturer of RLM Industrial Fluorescent Lighting Units or the RLM Standards Institute for RLM Emergency Specifications No. 15, No. 16 and No. 17.

LOOK FOR THIS LABEL AND BE SURE OF METAL-CONSERVING FLUORESCENT LIGHTING *At Its Best!*

Only lighting units that have been tested, inspected and certified under the auspices of RLM Standards Institute by the Institute's official testing laboratories as in conformance with the above specifications may bear the RLM LABEL.

Thus, the RLM LABEL becomes the user's warranty that the War-time Non-Metallic Reflector, as well as all other component parts of the Industrial Fluorescent Lighting Unit bearing it are properly engineered and built to give maximum light output and trouble-free operation.

Guarantee

This RLM certified lighting unit, when properly installed and under normal conditions of use, is guaranteed against mechanical and electrical defects for a period of 90 days from date of delivery to the purchaser. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee by the undersigned manufacturer or distributors.

MANUFACTURERS OF RLM REFLECTORS

ABOLITE REFLECTOR COMPANY, West Lafayette, Ohio
BENJAMIN ELECTRIC MFG. CO., Des Plaines, Ill.
BRIGHT LIGHT REFLECTOR CO., Brooklyn, N. Y.
DAY-BRITE LIGHTING, INC., St. Louis, Mo.
GOODRICH ELECTRIC COMPANY, Chicago, Ill.
THE MILLER COMPANY, Meriden, Connecticut
OVERBAGH AND AYRES MFG. CO., Chicago, Ill.
QUADRANGLE MFG. COMPANY, Chicago, Ill.
SMOOT HOLMAN COMPANY, Inglewood, California
WESTINGHOUSE ELECTRIC AND MFG. COMPANY, Cleveland, Ohio
WHEELER REFLECTOR CO. Boston, Massachusetts

RLM STANDARDS INSTITUTE
INCORPORATED
307 NORTH MICHIGAN AVE. • SUITE 1600 • CHICAGO, ILL.

NEW EQUIPMENT

Automatic Synchronizer

This new device is said to be simple in design, rugged in construction, easily installed and readily understood. Designed

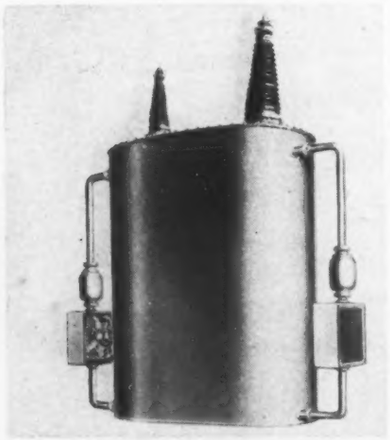
"Type XK" automatic synchronizer, for 50-60 cycle machines up to 250-kva. and voltages of 600 or less. Department 7-N-20 **Westinghouse Electric & Manufacturing Co.**, East Pittsburgh, Pa.

for use on small machines, the synchronizer is equipped with suitable governors and fast-closing contactors or breakers.

•

Cooling System

New cooling unit consists of a radiator-type cooler and a special pump with motor inclosed. These are connected by piping to the standard radiator valves at the side of the transformer. No stuffing boxes are required in the special pump and the motor is self-cooled and self-lubricated. Because the cooling unit is relatively small, usually more than one is required, depending upon the size of the transformer.

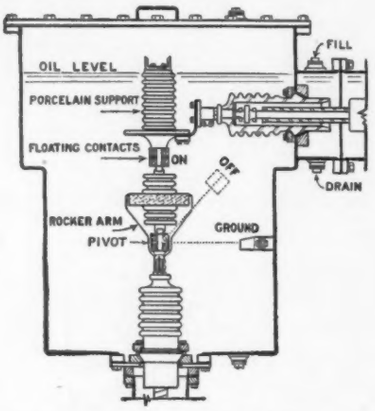


"Electro-Cooler" for forced-oil system for cooling transformers. **Allis-Chalmers Manufacturing Co.**, East Palestine, Ohio.

•

Sectionalizing Switch

Sectionalizing switch of established type, previously catalogued up to 15 kv. rating, now available for higher potential of 34.5 kv. may be had for horizontal or vertical connections or combination of the two. The switching links are incased in porcelain bushings. Separable connectors inside



Type RA, 34.5-kv., oil disconnect sectionalizing unit. **G. & W. Electric Specialty Co.**, 7780 Dante Avenue, Chicago, Ill.

procelain bushings are used for bus connections. Pothead and bus insulators are of unit detachable type.

•

Portable Grinders

Model "AD" and Model "AE," 4- and 5-in. grinders. **Skilsaw, Inc.**, Chicago, Ill.

Two new portable grinders for metal grinding and metal cleaning operations have ball bearings mounted in steel inserts on armature at extreme ends of wheel spindle to absorb thrust, eliminate vibration and insure cool operation. Commutator and switch are inclosed for protection against dust, and straight-line ventilation blows dirt away from operator and prevents clogging. Rubber sleeve handle for non-slip grip.

Fluorescent Lamp Starter

Improved fluorescent lamp starter locks dead lamps out of the circuit, thus allowing instant replacement. It offers several

"Master No Blink" manual reset starter; for 30-, 40- and 100-watt fluorescent lamps. **General Electric Co.**, Appliance and Merchandise Dept., Bridgeport, Conn.

advantages over the automatic starter which requires a flow of current to keep the dead lamp from flickering. With the new device no current flows through the ballast after the dead lamp has been locked out. This current cut-off feature prolongs the life of the ballast. It also eliminates the "cooling" period which is required for replacement of lamps using automatic starters. When a dead lamp is locked out of the circuit a small red button on top of the starter snaps forward. When the lamp is removed the button is pushed in to reset the starter without removing it.

•

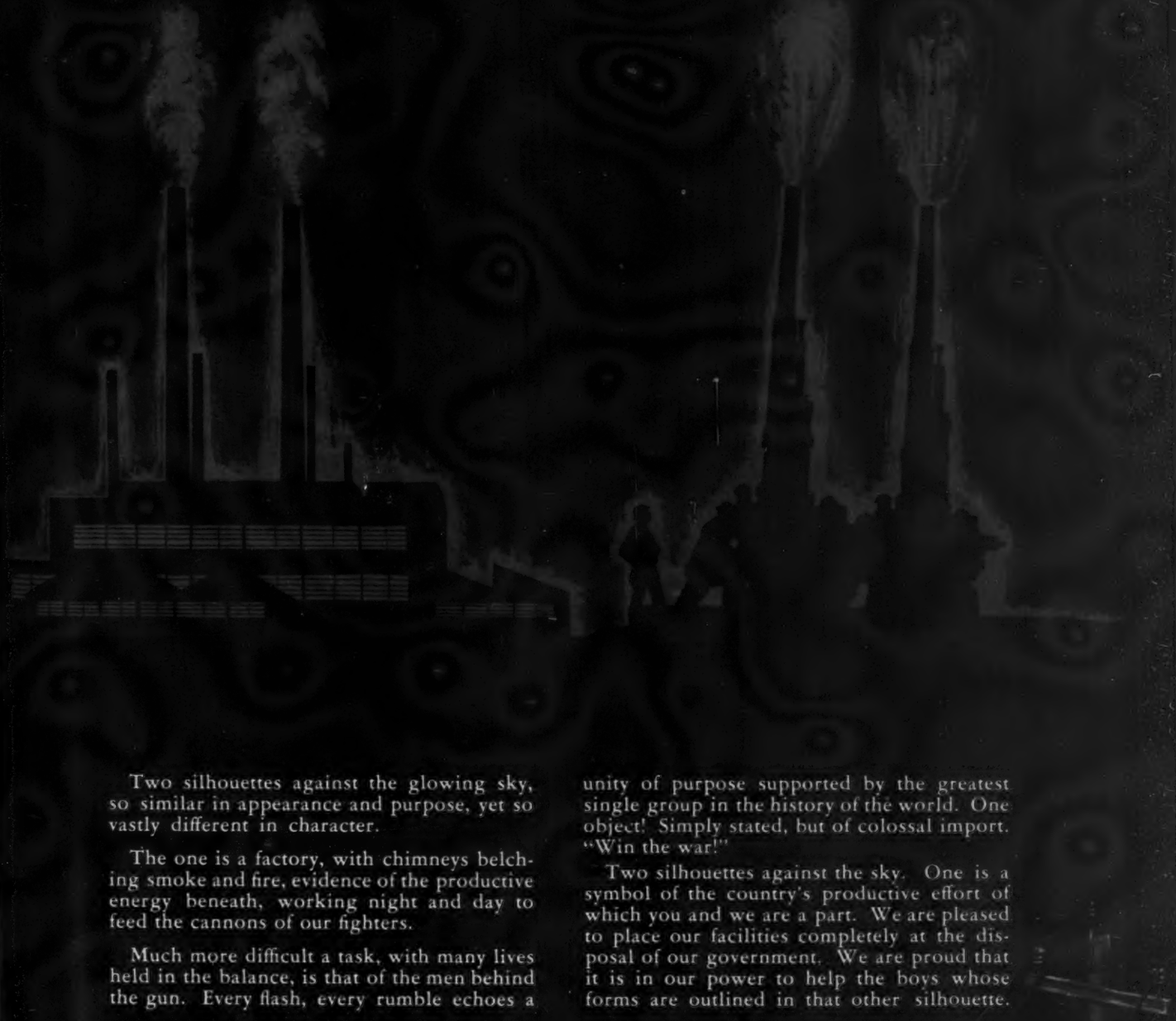
Varnish

R-878 insulating varnish. **Sterling Varnish Co.**, 127 Ohio River Blvd., Haysville, Pa.

New, flame-resistant insulating varnish is recommended for Class B high-temperature insulation. It is claimed the varnish, after drying, will not support combustion when the flame is removed, nor melt or resoften under operating temperatures.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

SILHOUETTES
in the night



Two silhouettes against the glowing sky, so similar in appearance and purpose, yet so vastly different in character.

The one is a factory, with chimneys belching smoke and fire, evidence of the productive energy beneath, working night and day to feed the cannons of our fighters.

Much more difficult a task, with many lives held in the balance, is that of the men behind the gun. Every flash, every rumble echoes a unity of purpose supported by the greatest single group in the history of the world. One object! Simply stated, but of colossal import. "Win the war!"

Two silhouettes against the sky. One is a symbol of the country's productive effort of which you and we are a part. We are pleased to place our facilities completely at the disposal of our government. We are proud that it is in our power to help the boys whose forms are outlined in that other silhouette.

"HANG THE LOAD ON HUBBARD HARDWARE"

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND . . . CALIFORNIA . . . CHICAGO

RUBBER COVERED POWER CABLES • BUILDING WIRE

VARNISHED CAMBRIC • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

CRESCENT

makes

Essential Cables

for

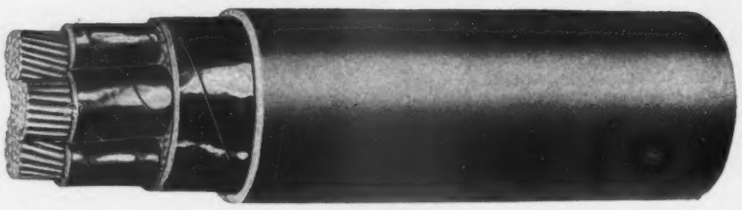
Essential Jobs

Here are just a few of the popular types of electrical wires and cables made at the CRESCENT plant.

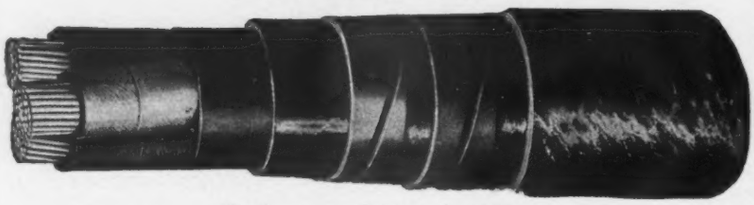
CRESFLEX Non-metallic Sheathed Cable

Lead Encased Power Cable

PERMACORD Heavy Duty Portable Cable



Varnished Cambric Power Cable



Parkway and Trench Cable

CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT

WIRE and CABLE

Factory: TRENTON, N. J.—*Stocks in Principal Cities*

CRESCENT ENDURITE SUPER • AGING INSULATION

TECHNICAL LITERATURE

RECOMMENDED PRACTICE OF OFFICE LIGHTING—Latest publication in the I.E.S. series. Lighting and seeing and factors in office work that affect them. Discussion of natural lighting including sizes, spacings, conditions and shadings of windows; of artificial lighting covering types and kinds. Specific recommendations for lighting for different kinds of office work and a discussion of wiring as affecting lighting performance. Available from the Illuminating Engineering Society, 51 Madison Avenue, New York, N. Y.

WARTIME CARE OF MOTORS—With electric motors running 168 hours a week instead of the former 40 hours in many plants, prevention of troubles assumes maximum importance. A rotor rim may travel the equivalent of around the world in eight days under three-shift operation. Inspection, adjustment and lubrication must be quadrupled, and every U. S. maintenance man is pitted against a Jap or Nazi upkeep worker. This 24-page, pocket-size booklet, "A Guide to Wartime Care of Electric Motors," B,6229, covers the adverse effects of dust, stray oil, moisture, friction, misalignment, vibration, uneven wear, overload, underload and motor ailment diagnosis and remedies. It contains no advertising and is adapted to the training of new men besides being useful to experienced maintainers. Available from Allis-Chalmers Manufacturing Co., Milwaukee, Wis., or branch offices.

WIRING—Detailed suggestions for wiring in accordance with 1940 Code requirements to save materials by application of porcelain knobs, tubes and cleats, presented in new 32-page "Installation Manual and Data Book on Porcelain Protected Wiring Systems" of Porcelain Products, Inc., Findlay, Ohio.

MANGANESE STEEL CHAINS—Properties of manganese-steel in tabular and catechistic form along with types of links devised for particular services in new bulletin No. 742 CN, "Chain for Elevating and Conveying," of American Manganese Steel Division, American Brake Shoe & Foundry Company, Chicago Heights, Ill.

DUST CONTROL—Description of Buell cyclone dust collection system in which is incorporated the van Tongeren "shave-off" principle. Explanation of the "double eddy" phenomenon employed to increase effectiveness of collection of extremely fine particles. Examples of applications to various requirements, including flue dust recovery from pulverized-fuel and stoker-fired boilers. Well illustrated with diagrams showing principles of operation and with pictures of typical installations. Buell Engineering Co., Inc., 70 Pine Street, New York, N. Y.

MAINTENANCE CHART—A chart for wall mounting tabulating 24 routine inspection check steps to facilitate keeping motors, control devices, lightning arresters, wiring, fuses and transformers in normal operating condition has been prepared for distribution by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

INSULATING VARNISHES—Methods of application, proper solvents and thinners, selection of most appropriate baking, air-drying, coreplate, etc., varnishes are discussed, along with tabulated properties of solvents in a new price list of Pedigree products issued by Insulation Manufacturers Corp., 565 West Washington Blvd., Chicago, Ill.

MANUFACTURING-MARKETS

Scrap Drive Pushed by Crocker-Wheeler

Crocker-Wheeler Electric Manufacturing Co., Ampere, N. J., is intensifying its scrap drive through the labor-management committee so that each employee will take an active part.

The theme of the drive, "Dig in and Dig Out the Scrap," is being prominently displayed on posters, scrap containers and in *Ampere Turns*, the employee magazine.

In addition to the regular salvage program, which has been yielding an average of 550,000 pounds of steel, copper, brass, aluminum, rubber and other critical scrap monthly, the Crocker-Wheeler Co. has set a quota of 200,000 pounds of the "might be of some use some day" type of scrap.

•

Makes New Record on Navy Units

Eight 600-kva. network transformer units have been shipped from an Allis-Chalmers Manufacturing Co. plant, completing a schedule-breaking record that has turned out every one of twenty units in from six to thirty days ahead of shipping dates in the Navy contract.

In an official communication the Navy praised highly the efforts to improve on the original schedule, citing the plant's "splendid co-operation."

Within two weeks after the order was received drawings had been approved, winding engineering and mechanical engineering specifications had been delivered to the production department and fabrication of the transformers began on a 168-hour-per-week basis.

•

Wins Army-Navy "E"

Electro-Metallurgical Co., Niagara Falls, N. Y., has been made the recipient by the War Department of the joint Army-Navy "E" production award for its outstanding performance of war work.

•

Opens Additional West Coast Branch Offices

Bailey Meter Co. has announced the appointment of L. F. Richardson as branch manager of its newly established Los Angeles office and H. T. Sawyer as branch manager of its newly established Seattle office. Mr. Richardson and Mr. Sawyer had previously been located in Los Angeles and Seattle, but had functioned as representatives of the San Francisco branch office. V. A. Rumble, manager of the company's San Francisco branch office, continues as West Coast supervisor.

ASA Approves Standard for Rubber Gloves

A standard which for many years has given protection to electrical workers by specifying the properties of the rubber gloves they wear has been given the status of American Standard by the American Standards Association. The new edition of the standard, Specifications for Electrical Gloves (C59-12-1942; ASTM D 120–40), limits the voltage stress through the wall of the glove to 3,000 volts.

This is a revision and unification of existing standards now in use by the Army, the Navy, the Radio Manufacturers Association, the Institute of Radio Engineers, and individual companies, with such additions and corrections as are necessary to make a consistent and thoroughly workable series of standard parts and material requirements.

"E" AWARD TO SCHENECTADY—Colonel Badeau (left) congratulates J. M. Howell, works manager, while Capt. Joseph S. Evans, U. S. N., extends congratulations to W. W. Trench, secretary of the General Electric Co., on the winning of the Army-Navy "E"

MAILING LISTS THAT WORK...

McGraw-Hill Industrial Mailing Lists are a direct route to today's purchase-controlling executives and technicians in practically every major industry.

These names are of particular value now when most manufacturers are experiencing constantly increasing difficulty in maintaining their own lists.

Probably no other organization is as well equipped as McGraw-Hill to solve the complicated problem of list maintenance during this period of unparalleled changes in industrial personnel. These lists are compiled from exclusive sources, based on hundreds of thousands of mail questionnaires and the reports of a nation-wide field staff, and are maintained on a twenty-four hour basis.

Investigate their tremendous possibilities in relation to your own product or service. Your specifications are our guide in recommending the particular McGraw-Hill lists that best cover your market. When planning your industrial advertising and sales promotional activities, ask for more facts or, better still, write today. No obligation, of course.

McGraw-Hill Publishing Co., Inc.
DIRECT MAIL DIVISION
330 West 42nd Street **New York, N. Y.**

Manufacturers Vote Common Dividends

Directors of the Reliance Electric & Engineering Co. paid a dividend of 25 cents a share on the common shares of the company on September 25 to stockholders of record September 18. The dividend just paid brings to 75 cents the amount for the year to date. In 1941 the company made payments of 25 cents in March, 37½ cents in June, 37½ cents in September and 50 cents in December.

Other companies voting dividends are:

Crocker-Wheeler Electric Manufacturing, two dividends of 10 cents each, one payable October 20 to stockholders of record September 30 and the other payable December 20 to stockholders of record November 30. Previous payments this year were 15 cents each on April 20 and July 20, which were the first since 1937.

Anaconda Wire & Cable, 25-cent dividend, or half the amount paid on July 20.

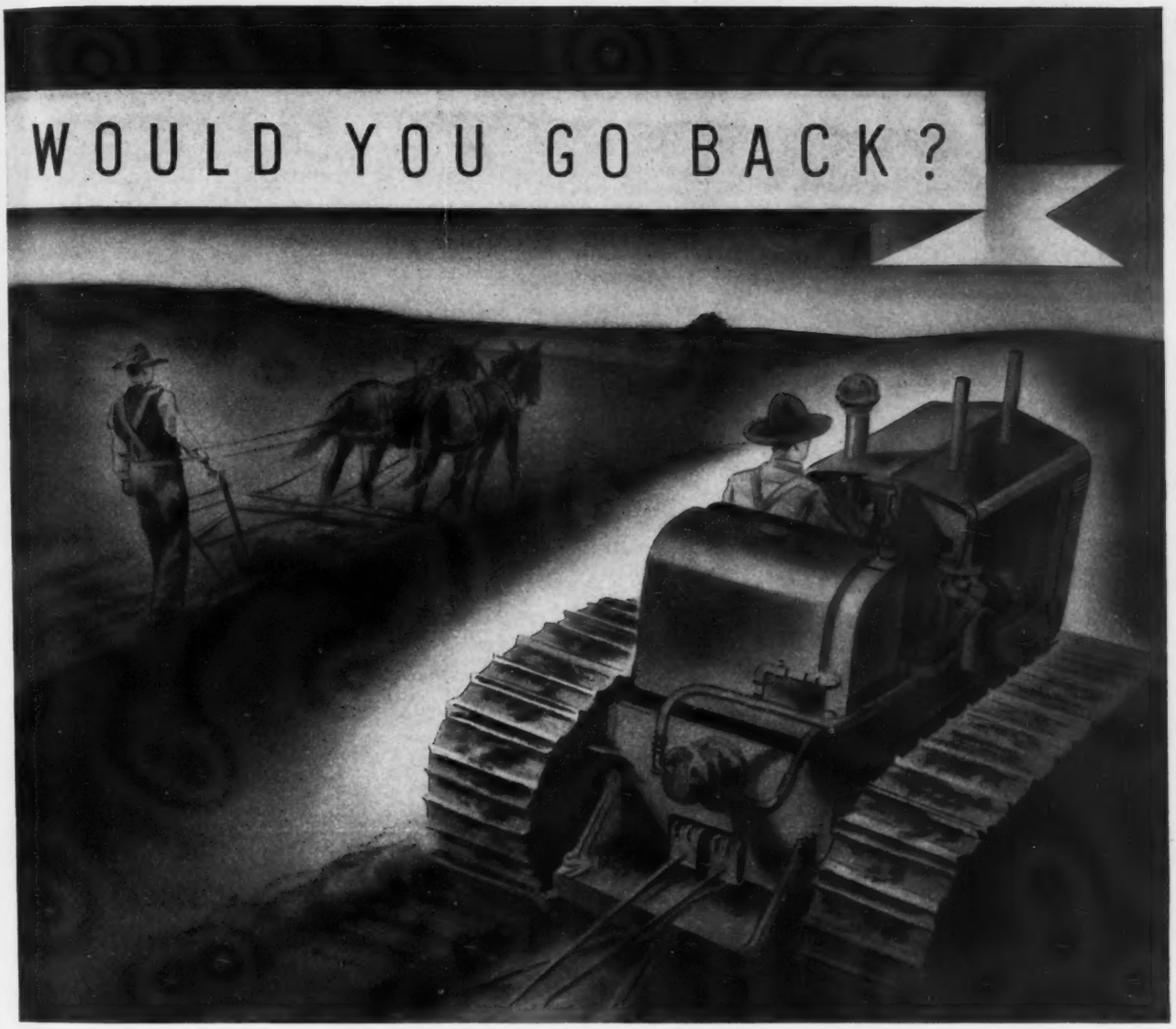
•

Manufacturers Issue Earnings Reports

Superheater Company and affiliated Canadian company report for the six months to June 30 net profit, after $1,029,676 provision for federal and dominion income and excess profits taxes, of $645,396, equal to 73 cents a share, against $754,954 or 85 cents a share last year, when $494,580 was charged out for dominion and federal taxes.

PHILCO CORP.—Net income in the second quarter, after provision for estimated federal and state income and excess profits taxes, amounted to $166,986 or 12 cents per share on the outstanding 1,372,143 shares of common stock. This compares with net income of $402,835 or 29 cents per share in the second quarter of last year. Gross sales for the second quarter totaled $15,342,393 as compared with $18,734,284 in the corresponding period a year ago. For the first six months of 1942, net income amounted to $449,777, equivalent to 32 cents per share. This compares with net income of $672,107 or 49 cents per share in the first six months of 1941, after income and excess profits taxes had been adjusted to reflect the effective tax rates actually incurred on the entire year's operations. Gross sales in the first six months of 1942 totaled $32,482,284, compared with $35,211,279 in the corresponding period a year ago.

STEWART-WARNER—Including subsidiary companies, for first six months ended June 30, tax-adjusted surplus net profit of $767,125, which includes a provision of $250,000 for contingencies. This is a decrease of $3,147 under the corresponding 1941 period, at which time net profit of $770,272 was reported. Tax provisions for the six months reported totaled $6,432,174, compared with $2,112,607 for the corresponding period a year ago. Earnings for the first six months of 1942, of 60 cents per share on 1,273,027 shares of common stock outstanding, include a dividend of 25 cents, totaling $318,257, paid June 30.



A BETTERMENT . . .

Not a Substitute

Is the tractor plow with its multi-furrow performance just a substitute for the "Grand Dad Time" single-furrow plow?

No . . . motorized modern farming machinery is a BETTERMENT.

Agriculture must produce food in the largest volume possible . . . in the shortest time practicable . . . and at the lowest cost. That is why substitutes will not answer and the rules of modern farming demand and get BETTERMENTS.

Likewise, engineers faced with the problem of replacing familiar materials . . . now so hard to get . . . are looking NOT for substitute materials but for materials that are superior, that will make possible weight savings, more efficient operation, longer life and greater dependability. If you are one of these engineers CONTINENTAL-DIAMOND can help you.

C-D NON-metallics provide unique property combinations. Great strength, yet light weight . . . high electrical insulating properties, yet ready fabrication in standard metal-working machinery . . . corrosion-resistant, yet tough and resilient . . . just to mention a few.

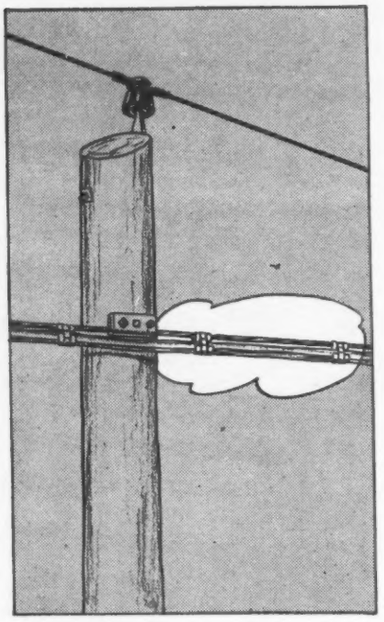
There are many places where C-D NON-metallic materials can be used to accomplish betterment of product, production or performance. The C-D Laboratory will be glad to work with you to determine where you can use C-D NON-metallics so that you will never have to go back to the "horse-drawn" plow.

Send NOW for Folder GF-12. Call on our engineers when you are ready to get down to brass tacks.

Continental-Diamond FIBRE COMPANY

Established 1895 . . Manufacturers of Laminated Plastics since 1911 — NEWARK • DELAWARE

Reduce Outages
Avoid Cable Wear
Reduce Maintenance



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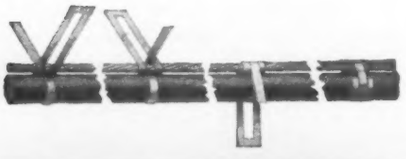
prolong life of cables and conserve strategic materials by eliminating wear on cable sheaths or on insulation of hand made cables. Reliable cable hangers hold cable and messenger together tightly with wide bearing surfaces which eliminate snaking and chafing. They are easily applied and make installations that are permanent and very neat.



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Field Reports on Business

Reports indicate continued rapid expansion of war production creating a heavy demand for a wide variety of electrical equipment. Dwindling of stocks of raw materials needed for war orders and a scarcity of skilled labor are critical aspects in the industrial situation.

PACIFIC COAST

The work of wholesalers in assembling and shipping Government orders has been particularly effective in the West, so far from normal sources of supply. Several separate manufacturers, including a national maker of lighting material, are dismantling their Pacific Coast stocks and returning the material to their factories, so as to better concentrate on the standardized items in heavy demand. Some small local fixture manufacturers have been warned to cease fabricating their accumulated stocks of critical raw materials.

Housing continues to be a major classification of war construction, for 50,000 new shipyard workers will need regular instead of temporary housing in the Bay area alone and scattered plants in often remote locations must be provided for. $13,000,000 additional has been allotted for 7,500 housing units in Portland, and work has begun on another block of 1,500 apartments for Richmond. 2,100 more units, costing $2,875,000, will be built for workers in Moore yard in Oakland, and Tacoma records low bids of $5,320,000 for 1,200 temporary dwellings and $1,849,060 for 400 permanent ones.

Specific orders and inquiries cover a year's incandescent and fluorescent lamp requirements, totaling close to $100,000, for Southern Pacific Railroad; $20,227 for 870 cedar poles for Nisqually Project No. 2 near Tacoma; 500,000 feet fibre conduit for Pacific Island bases; 100 miles signal cable for Coast Guard service along lower California coast; $12,013 for three 250 kva. Moloney transformers for Los Angeles; and many widely scattered awards for airfield lighting usually officially classified as being "under $50,000" each.

Industrial developments include an $18,000,000 contract for first three Kaiser cargo planes, to be built in Hughes plant at Culver City near Los Angeles; $600,000 additional construction for Lockheed plane factory at Burbank; and General Dry Battery Co.'s separator for manganese ore in Stanislaus County, California.

NEW ENGLAND

The electrical market is less spectacular due to some slackening in large war plant orders; on the other hand industrial activity is still high on account of sizeable backlogs and a wide variety of electrical equipment under production in New England plants. W.P.B.'s new ruling permitting service connections for electric ranges without special authorization was received favorably in New England utility circles Monday as a step allowing range stocks to move more freely, with corresponding savings assumed in domestic fuel consumption.

Negotiated contracts recently closed with manufacturers included a number of large motor-driven grinders, several lots of electro-magnets, and a large group of spotlight reflectors. Bookings in this district cover electrical heating units, cooking equipment, electric cable, and large amounts of nonferrous products, and bids are being placed for fuses, vacuum tubes, electric soldering irons, electric refrigerators, and insulation tape, the latter in considerable volume.

Wyman-Gordon Co., Worcester, Mass., has purchased 125-kw. in electric cooking equipment for a company cafeteria. Leland-Gifford Co., Worcester, has installed 37-kw. in cafeteria cooking equipment for executives' use. A Massachusetts factory making material for the government has installed 138-kw. in infra-red heating and spraying equipment for metal painting. One floor of the Paine Furniture Co. building, Boston, acquired for use by a government bureau, has been equipped with 240 Westinghouse 4-tube 48-in. fluorescent units. Anderson Coffey Co., Boston, has been awarded a contract amounting to less than $50,000 for the installation of a night lighting system.

New England retail trade is up slightly, compared with 1941. War orders are sustaining leather and textile goods manufacturers at a good level of activity.

NEW YORK

Department store sales for the week ended September 19 were up 5 percent over the corresponding 1941 week, according to the Federal Reserve Board. In the preceding week sales declined 3 percent from the '41 week, while in the last four weeks sales registered a 3 percent gain over the same period last year. Inventories on hand are estimated by competent authorities to be sufficient for about a six-month period.

Engineering construction volume for the week totaled $147,699,000 a decrease of 28 percent from the preceding week and 10 percent below the total for the corresponding 1941 week, according to *Engineering News-Record*. Private work is 9 percent under the preceding week and public construction declined 29 percent. The current week's volume brings 1942 construction to $7,632,606,000, an increase of 58 percent over the total for the 39-week period last year and 30 percent over the $5,868,699,000 reported for the entire 52 weeks of 1941.

CHICAGO

Construction work on new war plants, expansion of existing factories, army and naval cantonments and war housing projects is proceeding in substantial volume to create a heavy demand for a wide variety of electrical equipment. Orders received by most manufacturers are still well in advance of last year but the margin of increase is gradually leveling off. Near capacity production and delays in securing materials do not permit much expansion over present levels.

August building permits issued in 164 Illinois cities declined 65 percent in total and value from the same month last year. Employment of all classes in the state rose 2.6 percent between July and August while wages increased 4.9 percent. Wholesale and retail trade groups report losses in both employment and wage payments. Department stores sales in Chicago last week increased 8 percent over the previous week but declined 6 percent from a year ago.

J. Livingston & Co. and the Tri City Electric Co. were awarded the electrical contract on the Continental Roll & Steel Foundry Co. plant expansion costing in excess of $5,000,000. Meter room alterations will begin soon at a Commonwealth Edison Co. sub-station.

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The master detective is always on the job

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WHEN IT COMES to examining the billets from which Wolverine Condenser Tubes are made, every inspector in our plant is a Sherlock Holmes.

Wolverine Condenser Tubes are made by the extrusion process. A most important step in maintaining the uniform high quality of tubes produced by this more efficient method is the final inspection given each billet *before* it enters the extruder.

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Of course, this Wolverine Inspection-*before*-Extrusion Process takes more time, costs more money; but it's worth all that.

This "seeing-is-believing" attitude on the part of our inspectors, and the fact that Wolverine quality is now controlled from ore to finished product, assure you of condenser tubes that will measure up to your most exacting requirements.

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NEWS ABOUT PEOPLE

E. J. Machold Heads Niagara Hudson Power

Earle J. Machold has been elected president and a director of the Niagara Hudson Power Corp. to succeed the late Alfred H. Schoellkopf.

Mr. Machold has been closely identified with the operations of the Niagara Hudson System for the past twelve years as counsel for the companies. He was a partner in the law firm of LeBoeuf, Machold & Lamb of New York City from 1930 to date and prior to that time was associated with Attorney Charles A. Phelps at Watertown, N. Y.

Blank & Stoller

Born in Ellisburg, N. Y., Mr. Machold attended Phillips Andover and Syracuse University, obtaining his law degree from Syracuse in 1927. He was admitted to the New York State Bar in 1928. Mr. Machold is a trustee of Syracuse University and a member of the American Bar Association and the New York State Bar Association.

•

▶ BAYES JORDAN, lighting engineer for the Georgia Power Co. at Columbus, has been transferred to the company's general office, succeeding JESSE LONG, now in military service. Mr. Jordan is succeeded at Columbus by JOE BROWDER, transferred from Columbus.

▶ WALLACE M. HARRELL, auditor for the Arkansas Power & Light Co. for 14 years, has been named assistant treasurer of the company.

▶ PRESTON S. ARKWRIGHT, president of Georgia Power Co., has been appointed to a three-man advisory panel for the sub-office of the Army Ordnance Department which was recently established in Atlanta. This panel will be consulted by Army men for advice on all district matters, such as the selection of key personnel, discussion of why and where new business will be placed, labor problems, the difficulties of small business and other such matters.

▶ M. A. WOOD, for 15 years chief clerk of the San Luis Obispo district, Pacific Gas & Electric Co., has been made district manager, succeeding the late Charles J. Kelley. A graduate of Stanford University, Mr. Wood started with the San Joaquin Light & Power Co. at Merced in 1923 and was transferred to San Luis Obispo in 1927.

▶ JOSEPH K. CLOSE, who has been associated with the advertising work of Owens-Illinois Glass Co. for several years, has been appointed manager of the company's recently organized division of market research.

▶ JOHN L. O'TOOLE, who retired in August from the position of vice-president of the Public Service Corp. of New Jersey in charge of public relations, was honored recently at a luncheon at the Essex Club in Newark. Among the fifty members of the Public Service organization who attended were Thomas N. McCarter, chairman of the board; Edmund W. Wakelee, president; Percy S. Young, chairman of the executive committee; other vice-presidents, members of the board of directors and a few other executives.

S. P. MacFadden of Seattle Assumes Broader Duties

Samuel P. MacFadden, vice-president of the Puget Sound Power & Light Co. since 1930, has been elected to the position of executive vice-president, an office left vacant since the retirement of William H. McGrath in 1937.

Mr. MacFadden is a native of Laredo, Tex., and received his technical education at Texas A. & M. College. After spending one year with the Westinghouse Electric & Manufacturing Co., he became identified with the Beaumont Electric Light & Power Co. and later with the Eastern Texas Electric Co., both Stone & Webster properties. From 1920-23 he was assistant to the district manager of Stone & Webster, Inc., at Houston and then was appointed superintendent of light and power of the Eastern Texas Electric Co., Port Arthur. He spent five years with the Western Public Service Co., Scottsbluff, Neb., before receiving his assignment to the Puget Sound properties.

Mr. MacFadden served as president of the Northwest Electric Light and Power Association last year and while in Nebraska he was president of the Nebraska section of the old National

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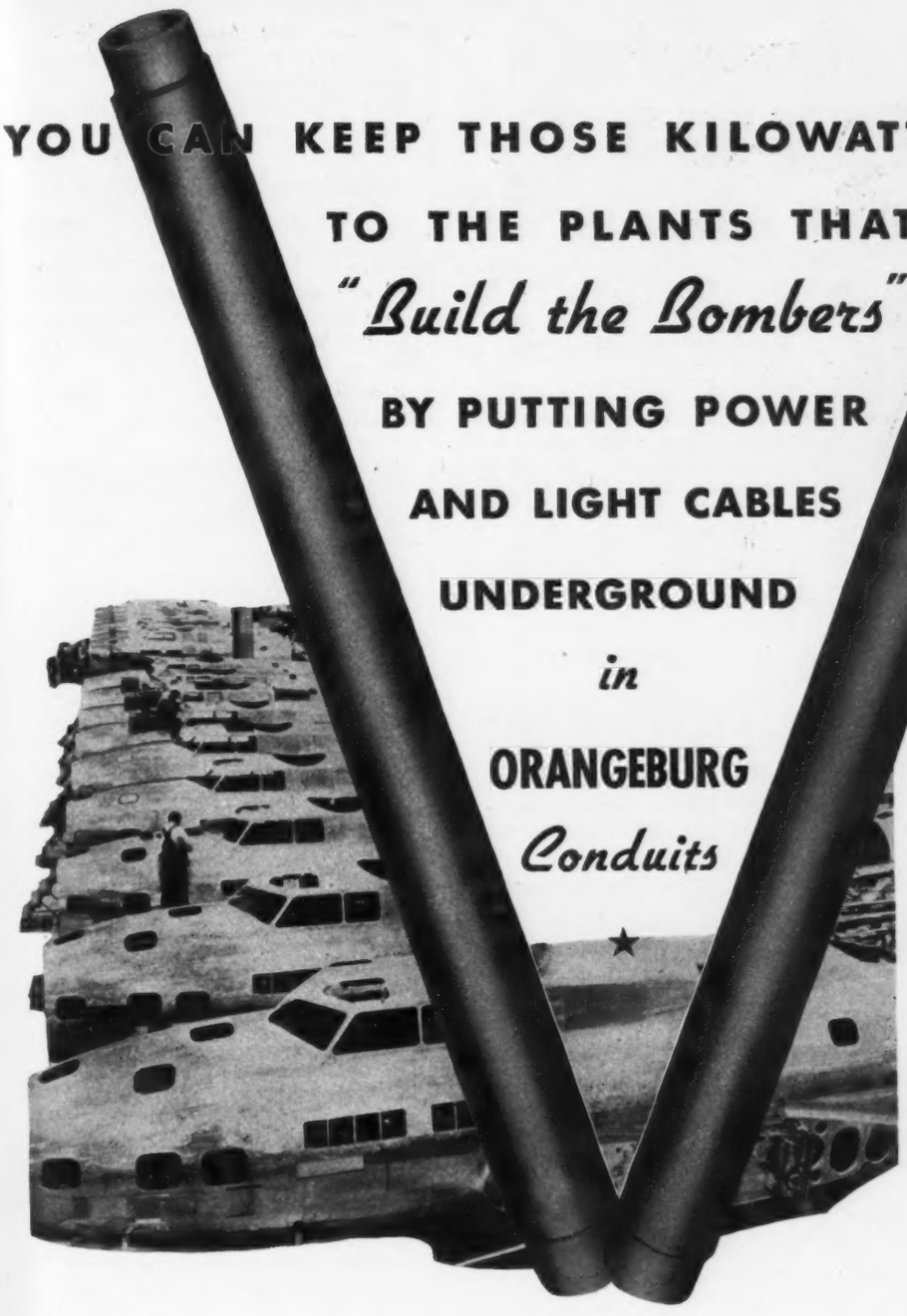

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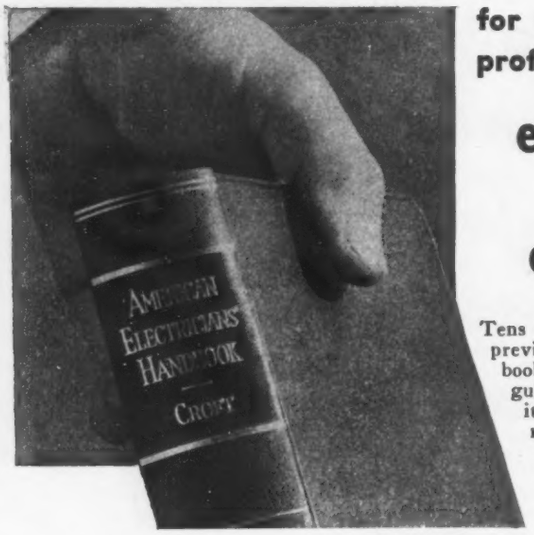

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Electric Light Association. He is a member of the American Institute of Electrical Engineers.

•

American Steel & Wire Promotes E. F. Pierson

Ernest F. Pierson has been appointed manager of the electrical and wire rope department of the American Steel & Wire Co. at Boston, Mass., succeeding the late Hugo D. Sharp. Mr. Pierson has been with the company about 30 years, beginning with the

manufacturing division at its Worcester, Mass., mills and later employed in the cable engineering department in that city. From 1927 to 1934 he was connected with the sales department at Boston, returning to the general sales office at Worcester with the title of general sales representative.

In 1941 Mr. Pierson was granted a leave of absence to become adviser to the purchasing division and copper branch of the OPM at Washington and was later made consultant to the copper branch of the WPB with headquarters in that city.

•

▶ ROGER HACKNEY has been appointed treasurer of the Johns-Manville Corp. In his new office Mr. Hackney, who has been assistant treasurer, will continue to serve on the staff of R. W. Lea, vice-president in charge of finance.

▶ DR. CHARLES F. BURGESS, inventor of the Standard Burgess battery, has been awarded the Edward Goodrich Acheson Medal and $1,000 prize by the Electrochemical Society. The Acheson medal and prize is the highest award in the field of electrochemistry. Dr. Burgess is the inventor of numerous and highly diversified products and processes. He is a director of the Burgess Battery Co., Burgess Cellulose Co., Burgess-Parr Co.

and the Thordarson Electric Manufacturing Co. In England his interests are represented by the Burgess Products Co., Ltd., and the Burgess Zeolite Co., Ltd. Dr. Burgess spends a large part of his time in a well-equipped laboratory on Burgess Isle, off the west coast of Florida.

▶ THOMAS K. MIAL, vice-president of Johns-Manville Sales Corp. and sales manager of the industrial department, was honored at a luncheon last week by his associates upon completion of his twenty-fifth year with the organization.

▶ VALLANCE W. COLLINS, controller and assistant treasurer of the Rome Cable Corp., Rome, N. Y., has been elected to active membership in the Controllers Institute of America.

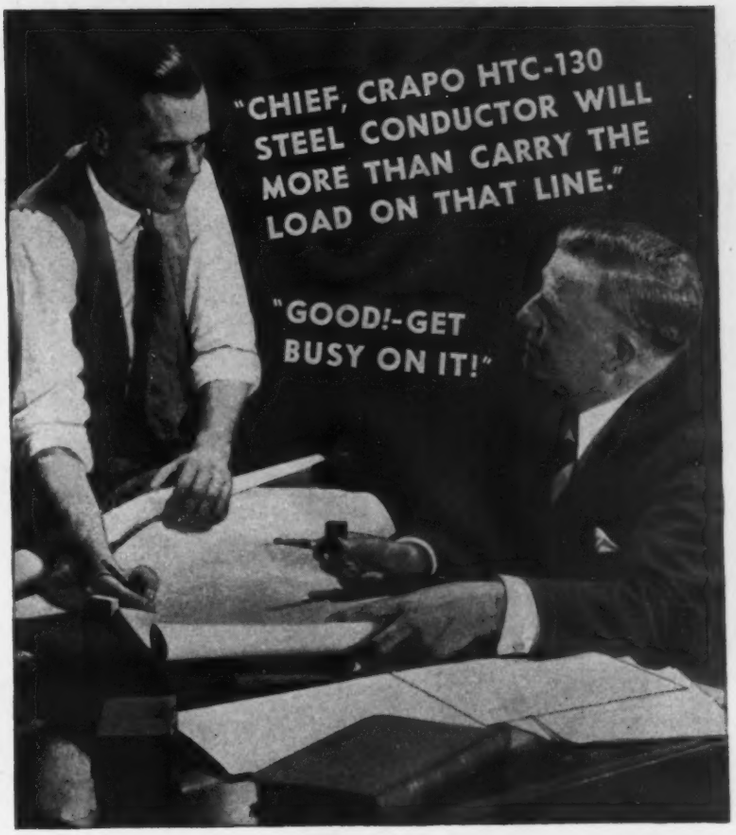
▶ THOMAS O. ARMSTRONG has been appointed manager of the industrial relations department of the Westinghouse Electric & Manufacturing Co., East Springfield, Mass. A well-known author and lecturer on safety and labor relations, Mr. Armstrong will direct the plant's employment, health, job analysis and service activities. He has been supervisor of industrial relations at the East Springfield plant for six years.

▶ CLAUDE WOOD has been appointed manager of the Cullman Electric Co-operative, Cullman, Ala., to succeed J. O. Petree.

▶ LINDSAY M. NEILY, lighting engineer for the Georgia Power Co. at Columbus, has resigned to take a position with the War Department at Lexington, Ky.

▶ HILAND G. BATCHELLER, president of the Allegheny-Ludlum Steel Corp. of Pittsburgh, has been appointed head of the WPB iron and steel branch. David F. Austin, deputy chief of the Branch, who has been acting as chief since the resignation of Reese H. Taylor last month, has been compelled by ill health to take an extended leave of absence and will return to the War Production Board on recovery of his health. A resident of Pittsburgh, Mr. Batcheller is a graduate of Wesleyan University, Middletown, Conn. In 1941 he served as a consultant in the priorities division of the Office of Production Management.

▶ HUGO E. BECKER, a Westinghouse sales engineer on the Pacific Coast since 1925, has been appointed supervisor of the newly created maintenance sales department for the company's Pacific Coast district. In his new position Mr. Becker will co-ordinate the work of three major maintenance divisions of the company—renewal parts, field engineering and repair plants—to minimize breakdown outages and



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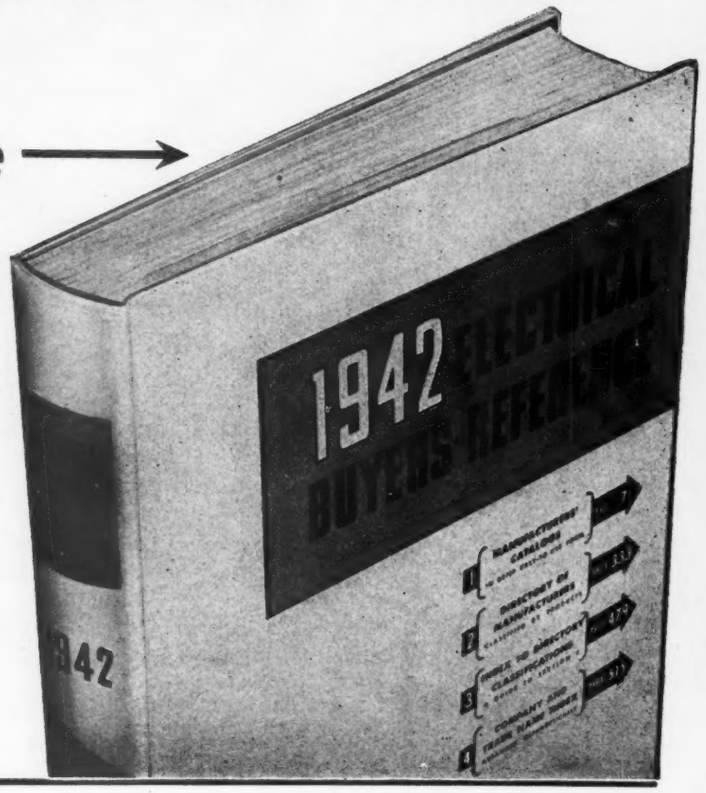

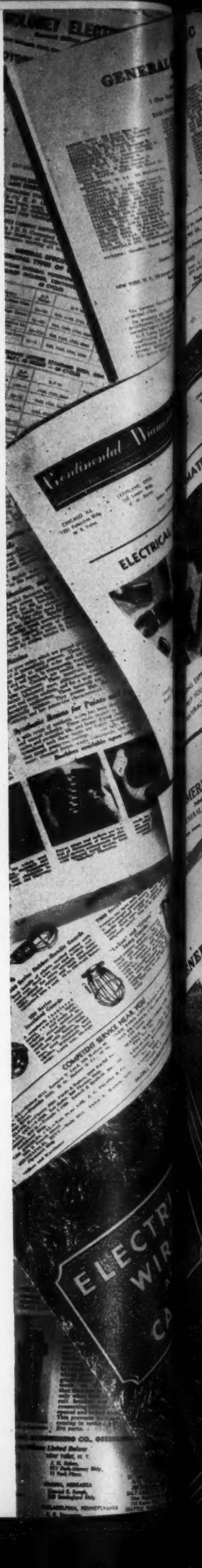

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insure uninterrupted production in industrial plants, most of which are engaged in production for war. In addition to industrial plants, he will co-ordinate maintenance of existing Westinghouse equipment in the marine industry and electric utilities and on transportation systems. Mr. Becker received an engineering degree from Stanford University and then joined Westinghouse at East Pittsburgh, Pa., as a graduate student. Later he was assigned to the central station division and in 1925 was transferred to the Pacific Coast.

▶ HENRY J. CHANON, lighting engineer with the General Electric lamp department at Nela Park headquarters in Cleveland, Ohio, has been transferred to the company's South Pacific division in Los Angeles. In his new work Mr. Chanon will specialize in the design of lighting systems for maximum production and efficiencies in west coast aircraft industries, in shipbuilding and wartime motion-picture production work. He will also serve as consultant for blackout of coastal areas in the southern California region. Mr. Chanon is a member of the Illuminating Engineering Society of the A.I.E.E.

OBITUARY

Edward W. P. Smith

Edward W. P. Smith, consulting engineer for the Lincoln Electric Co., and widely known as an authority on arc welding, was found dead on September 19 in his berth aboard a train taking him back to Cleveland from Indianapolis. Mr. Smith, who had addressed a meeting of the American Welding Society at Indianapolis, had boarded the train immediately after the meeting.

A veteran of more than 20 years' service with the Lincoln Electric Co., Mr. Smith had traveled extensively in the last year in the interests of the war production program. Visiting many war industry centers, he had been conducting welding courses and giving lectures on the latest techniques in welding. Mr. Smith was born in Cleveland and was graduated from Colorado College, Colorado Springs, Colo. Before joining Lincoln Electric as a tester he had worked in the electrical inspection department of the city of Cleveland and for the Westinghouse Electric & Manufacturing Co. in Pittsburgh. He had developed several original methods of demonstrating the stresses in metals and was to have been chairman of a number of technical sessions at the convention of the American Welding Society in Cleveland in October. In addition to membership in the A.W.S., Mr. Smith was a member of the American Society of Mechanical Engineers, American Society of Testing Materials and the Cleveland Engineering Society.

◆

▶ GERALD J. CLARK, electrical inspector of Bremerton, Wash., died recently at his home in that city.

▶ H. R. ALLEN, for many years inspector of wires for the city of Brockton, Mass., died recently in that city. He retired in 1939.

▶ WILLIAM MERRIFIELD, retired consulting engineer, who had been connected with the Consolidated Edison Co., Inc., of New York for 38 years, died on September 20 at his home in New Brighton, Staten Island, after a brief illness. He was 68 years of age. Born and educated in Ireland, Mr. Merrifield came to this country when a young man. He retired from Consolidated Edison's service two years ago.

▶ JAMES J. BURNS, advertising manager for the Metropolitan Edison Co., Reading, Pa., for 25 years, until his retirement last July because of ill health, died on September 18 in Reading Hospital. His age was 63. For 20 years prior to engaging in utilities' service he was a newspaper man. During his connection with Metropolitan Edison, an Associated Gas & Electric unit, and its affiliates he spent nearly ten years in the New York and New England territories for Associated.

▶ H. CLYDE SNOOK, inventor of an electrical stethoscope and developer of many instruments used in the medical field, died on September 22 at his home in Summit, N. J. He was 64 years old. Dr. Snook was recognized not only for his achievements in improving X-rays, but also for his contributions to the radio, optic and metallurgy fields. He was born in Antwerp, Ohio, and received his technical education at Ohio Wesleyan University, Allegheny College and the University of Pennsylvania. He was president of the Roentgen Manufacturing Co. of Philadelphia, 1903-1913; vice-president Victor Electric Corp. of Chicago, 1916-18; electrical engineer with Western Electric, 1918-1925, and served with Bell Telephone Laboratories from 1925-27. Since then he had been a consulting engineer. In 1919 Mr. Snook received the Edward Longstreth medal of the Franklin Institute and was also the recipient of awards by the Radiological Society of North America and the American College of Radiology. Mr. Snook was a fellow of the American Institute of Electrical Engineers and the American Physical Society and in 1930 he was chairman of the noise elimination committee of the National Safety Council.

Municipal Utilities Association Formed

Utilities Commissioner George A. Pierce of Jacksonville was elected president of the newly organized Municipal Utilities Association, composed of officials of Florida municipally owned electric and water production and distribution systems. Organization of the association was recently completed and the constitution and by-laws were approved and adopted and other officers elected. Mayor Alex McWilliams of Vero Beach was elected vice-president and M. W. Brown, manager of the Orlando municipal light plant, was elected secretary and treasurer.

The purpose of the association, President Pierce said, is to make a study of all municipal problems so far as they affect the operations of municipally owned electric and water production and distribution systems, to work for the general improvement of the municipal properties through co-operated effort and to promote the exchange of ideas and experiences in the successful method of operations and management of such systems.

•

Westinghouse to Award "4-H" Scholarships

Six $200 college scholarships will be awarded by Westinghouse Electric & Manufacturing to winners of the seventh annual National 4-H Club rural electrification contest now in progress, according to B. P. Hess, manager of Westinghouse rural electrification. Contestants will prepare reports on electrical studies and projects to serve as the basis for selecting the winners.

In addition to scholarships, free trips to the 4-H Club Congress at Chicago, November 27 to December 5, will be provided for winners of state contests and gold pins for winners in county competitions. The contest is conducted by the extension service of state agricultural colleges, the United States Department of Agriculture and the National Committee on Boys and Girls Club Work. The first National 4-H Club rural electrification contest was held in 1936.

•

Makes Turbine Spindles

Steel turbine spindleshafts for naval vessels are now in production at a plant of the Pittsburgh Plate Glass Co. under subcontract from the steam division of the Westinghouse Electric & Manufacturing Co. In an effort to speed production of this vital war

FIRE and how to fight it!

HOW OFTEN SHOULD

EXTINGUISHERS

BE RE-CHARGED?

Is your fire-fighting equipment in good condition—ready for a sudden emergency? Even the finest portable extinguishers cannot retain full effectiveness indefinitely. Some day one of your extinguishers may be called on to save your plant. Insure reliability of your fire-fighting equipment. Follow the simple rules charted below.

		WILL IT FREEZE?
CARBON DIOXIDE	DO THIS ONCE EACH YEAR Weigh to detect leakage. If extinguisher shows loss of weight of less than 10% of rated capacity, stamped on label, nothing need be done. Recharge if weight loss shows greater than 10%.	no
SODA ACID	DO THIS ONCE EACH YEAR Discharge and refill. Mix soda solution outside extinguisher, following manufacturer's instructions. Use lukewarm, not hot water. Wash all parts with water. Examine for clogging or corrosion.	yes Do not keep outdoors in cold weather.
PLAIN WATER	DO THIS ONCE EACH YEAR Inspect by removing and weighing carbon dioxide cartridge. Replace cartridge if weight loss exceeds ½ ounce. Inspect hose and nozzle for clogging or corrosion, and check the quantity of water.	See label for this information.
FOAM	DO THIS ONCE EACH YEAR Recharge. Mix solution outside the extinguisher according to manufacturer's exact directions. Wash all parts thoroughly with water. Test hose. Examine for corrosion or clogging.	yes Do not keep outdoors in cold.
VAPORIZING LIQUID	DO THIS ONCE EACH YEAR Test by partially discharging. Pump a few strokes with extinguisher first aimed upward and then downward. Replace lost liquid, as furnished by manufacturer.	no
DRY COMPOUND	DO THIS ONCE EACH YEAR Remove and weigh carbon dioxide cartridge. Replace if it shows loss of weight of more than ½ oz. for 12 lb. extinguisher or 1 oz. for the 20 lb. size. Check quantity of dry compound and determine that it is free-flowing.	no
CARBON DIOXIDE SYSTEM	DO THIS ONCE EACH YEAR Weigh cylinders to check loss of contents. Blow out carbon dioxide lines. Check all releases, thermostats, tubing, switches, pull boxes and electric lines.	no

MORE EFFECTIVE FIRE FIGHTING

Since December 1941 Walter Kidde and Company has had an unusual war job . . . to make products that save fighting men's lives. These products include high pressure containers for aviation use, special type built-in extinguishing systems, crash trucks and various flotation equipment.

Since we have fewer Kidde extinguishers* to sell, we are trying to make your existing fire-fighting units more effective.

If you want reprints of this series of advertisements, just write to

Walter Kidde & Company, Inc., 1028 West St., Bloomfield, N. J.

Kidde

*Formerly known as "LUX" extinguishers

NOTE: *Recharge extinguishers immediately after use, even though only partially expended.*

EXTRUDED VINYLITE TUBING

Natvar V.I.T. #200:

The flexibility is excellent through a wide range of temperatures. A 0.016" wall tubing can be bent back on itself without cracking when tested as low as minus 50° F.

The dielectric strength averages 1100 volts per mil.

Natvar V.I.T. #201:

Will not lose its form up to 240° F. Resistant to pitch at 350° F. poured over the tubing to a depth of ½ inch.

The dielectric strength averages 800 volts per mil.

Natvar V.I.T. #202:

Excellent flexibility down to minus 70° F.

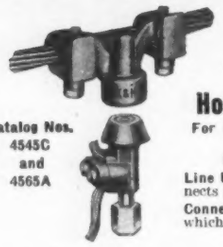
The dielectric strength averages 500 volts per mil.

SUPPLIED ONLY FOR DEFENSE ORDERS

Write for samples and information!

THE NATIONAL VARNISHED PRODUCTS CORP.
211 Randolph Avenue, Woodbridge, New Jersey

A Live Wire is no better than its Connections



K & H
Hot Line Clamps
For Copper and Aluminum Lines
Made in Two Parts

Catalog Nos. 4545C and 4565A

Line Unit—The part that connects permanently to the line.
Connector Unit—The part to which tap wire is attached.

These clamps are designed to overcome three objectionable features encountered in making hot line connections in the past, viz.:

1—To eliminate arcing or crushing of line while connecting or disconnecting tap wire.

2—To prevent atmospheric corrosion of threads, rendering them useless.

3—To forestall mechanical failure caused by ice and sleet.

HOT LINE STICK ADAPTER
Quickly and easily attached to any Standard Hot Line Stick

Catalog No. HLA2

★ **WRITE FOR BULLETIN No. 11-A** ★

K&H KRUEGER & HUDEPOHL
Solderless Terminal Lugs and Connectors
S. E. VINE AT THIRD • CINCINNATI, OHIO

equipment, more than $15,000,000 worth of subcontracts have been placed by the steam division, where turbines and gears for naval and merchant vessels are built.

•

TVA Production at All-Time Record

Tennessee Valley Authority is producing power at an all-time high and has become the second largest power system in the nation, second only to Niagara-Hudson, according to a recent announcement by James P. Pope, director. No rationing of electric power was in prospect for this fall or winter, the director added.

Despite a recent WPB ruling lowering priorities for TVA dams now under construction, Pope said, work would continue on schedule on the more important dams. Improved priorities have been obtained for the Kentucky and Fontana dams, he pointed out, and both would be completed early in 1944. Construction on Douglas Dam is ahead despite adverse weather.

•

Order Restrains Utility in Lebanon Plant Case

Judge Ernest R. Stewart in Circuit Court at Lebanon, Ind., has issued an order temporarily restraining the Public Service Co. of Indiana from interfering with the city of Lebanon in the distribution of electric power. The utility was restrained from preventing collection of bills and from continuing reading meters.

The city contends the utility has asserted ownership and control of the electric distribution system in open defiance of a judgment rendered in Circuit Court in July and in spite of the fact that the Indiana Appellate Court has refused to grant an injunction against the city.

•

Pole Treatment Record Set in 1941

The number of poles of all species given preservative treatment in 1941 was 5,115,260—the largest number ever reported for a single year, according to figures compiled by R. K. Helphenstine, Jr., of the U. S. Forest Service and released by the American Wood-Preservers Association. The figure represents an increase of 903,357 poles over the number treated in 1940.

Of the total poles treated, 3,670,681, or 71.76 percent, were Southern pine. Western red cedar ranked second in

HIGH GRADE HARD PORCELAIN
FOR
Electrical Specialties
High and Low Voltages

IMPERIAL PORCELAIN WORKS
TRENTON, NEW JERSEY

G.C.A.
Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks

Send for Catalogue

We have been making safety tools for 26 years

THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

AIR COOLED TRANSFORMERS 50 KVA UP TO 2400 VOLTS

Acme Air Cooled Transformers now available in following ratings.

3 to 50 KVA, 60 cycle, 3 phase 240/480; 600; 2400 volt primary.

1½ to 50 KVA, 60 cycle, single phase 240/480; 600; 2400/4160 volt primary.

Write for Acme Air-Cooled transformer Bulletin.

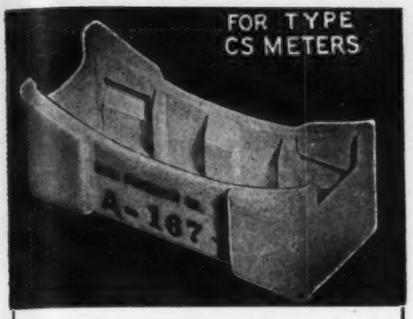
THE ACME ELECTRIC & MFG. CO.
43 Water St. Cuba, N. Y.

Acme Electric

THE ELECTRICAL BUYERS REFERENCE is packed full of buying and specifying information, all in one handy, ever-ready volume.

Active electrical men say it's the most valuable volume in their offices. Use it yourself . . . it's *your first source of information.*

• ELECTRICAL • BUYERS REFERENCE
330 West 42nd Street, N. Y. City



Here's A Meter Seal Made of

PORCELAIN!

That means something these day when metal is so hard to get. Not only that, this seal has to be broken for the thief to tamper with the meter. Send for a sample.

Write to

STAR PORCELAIN CO.

51 Muirhead Ave., Trenton, N. J.

3 TIMES THE SERVICE

24 HRS. A DAY

TRICO

"Powder-Packed" RENEWABLE **FUSES**

AND

KLIPLOK CLAMPS

Here's 3 shift protection against unnecessary shutdowns caused by faulty fusing and bad clip contact. TRICO "Powder-Packed" fuses and Kliplok clamps stop wasted current and time loss . . . Give full protection 24 hrs.

Write for Bulletins 1 and 6

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

quantity with 1,162,987, Northern white cedar ranked third and Douglas fir fourth. Of all poles treated, 73.4 percent were pressure treated and 1,360,367 were given butt treatment; 96.85 percent were treated with creosote.

•

REA Allots $647,200 to 15 Systems

The Rural Electrification Administration recently announced allotments totaling $647,200 to fifteen systems in eleven states. This brings total allotments to $459,614,344, of which $802,000 represents operations during the current fiscal year.

Administrator Harry E. Slattery pointed out that no new construction will be undertaken except in accordance with authorization or regulation of the War Production Board.

Among the allotments are the following:

IDAHO—Prairie Power Cooperative, Inc., Fairfield, E. J. Williams, supt., $5,000 to connect members along present lines.

ILLINOIS—Illinois Valley Electric Cooperative, Inc., Princeton, J. H. Wolfe, supt., $15,000 to connect members along present lines.

INDIANA—Southern Indiana Rural Electric Cooperative, Inc., Tell City, K. L. Kester, supt., $5,500 to provide office headquarters building.

IOWA—Calhoun County Electric Cooperative Assn., Rockwell City, James Esmay, supt., $35,000 for 540 miles of line, 1,290 consumers. This includes $29,150 to reimburse member connection and general funds, and $5,490 to connect members.

MINNESOTA—Red River Valley Cooperative Power Assn., Halstad, John Gossman, supt., $10,000 to reimburse member extension fund. Mille Lacs Region Cooperative Power & Light Assn., Aitkin, $39,000 for rehabilitation and to connect members along present lines. Dairyland Electric Cooperative, Inc., Grand Rapids, E. J. Adey, supt., $34,000 to reimburse member connection fund.

MISSISSIPPI — Jones County Electric Power Assn., Laurel, S. L. Smith, supt., $20,000 to connect members along present lines.

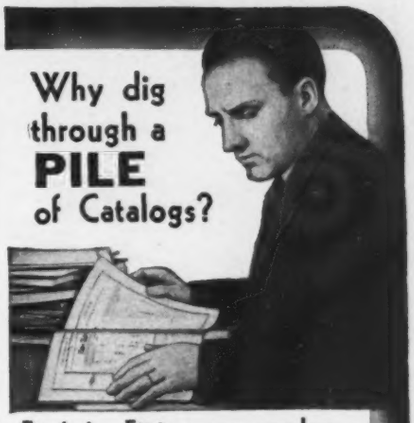
NEBRASKA—Chimney Rock Public Power District, Bayard, $3,700 for purchase and remodeling office headquarters building. Burt County Rural Public Power District, Tekamah. E. D. Beck, supt., $5,000 to complete office headquarters building.

NORTH CAROLINA—Jones-Onslow Electric Membership Corp., Jacksonville, H. P. Cotton, supt., $430,000, partial allotment, for construction of generating and transmission facilities to supply power to large consumer.

OHIO—Paulding-Putnam Electric Cooperative, Inc., Paulding, $15,000 to connect 129 members along present lines.

TEXAS—Mid-South Electric Cooperative Assn., Navasota, R. S. Greenhaw, supt., $10,000 to cover increased costs.

WASHINGTON—Columbia County Rural Electric Assn., Dayton, L. R. Martin, supt., $10,000 to connect members along present lines. Public Utility District No. 1 of Kittitas County, Ellensburg, Robert Kuhn, supt., $10,000 to connect members along present lines.

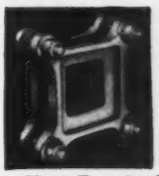


Find the Fitting you need—quickly—in the COMPLETE line

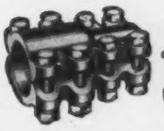
If you have a Penn-Union Catalog, you can instantly find practically every good type of conductor fitting. These few can only suggest the variety:

Universal Clamps to take a large range of conductor sizes; with 1, 2, 3, 4 or more bolts.

L-M Elbows, with compression units giving a dependable grip on both conductors. Also Straight Connectors and Tees with same contact units.



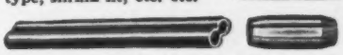
Bus Bar Clamps for installation without drilling bus. Single and multiple. Also bus supports — various types.



Clamp Type Straight Connectors and Reducers, Elbows, Tees, Terminals, Stud Connectors, etc.

Jack-Knife connectors for simple and easy disconnection of motor leads, etc. Spring action — self locking.

Vi-Tite Terminals for quick installation and easy taping. Also sleeve type terminals, screw type, shrink fit, etc. etc.



Splicing Sleeves, Figure 8 and Oval, seamless tubing—also split tinned sleeves. High conductivity copper; close dimensions.

Preferred by utilities, industrials, electrical manufacturers, contractors — because *they have found that "Penn-Union" on a fitting is their best guarantee of Dependability.*

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

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Consulting Engineers

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THE ONE-STEP METHOD
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Engineers
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General Hydraulic Engineering, including the design, financing, construction and management of hydro-electric power plants.

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(Electric & Telephone Line Construction Co.)

Wood pole transmission lines
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Electrical Testing Laboratories Inc.

WAR WORK TESTS

ELECTRICAL — MECHANICAL — PHYSICAL — CHEMICAL — for compliance with Government Specifications.

Inspection—Analysis—Research—Certification

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Public Utility Management Problems
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Electric, Steam and Hydraulic Projects. Investigations, Reports, Designs and Appraisals.

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Engineering - Electrical Construction - Management - Electric and Gas Street Lighting Maintenance

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Rate Investigations and Comparisons
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Hydro-Electric Development, Dams, Water Supply, Flood Control. Engineering Problems relating to Water Rights and Water Power Law. Appraisals.

New York City, 50 Church St.

THE J. G. WHITE ENGINEERING CORPORATION

Engineers — Constructors

New York, N. Y.

Sales Opportunities

ARIZONA—Salt River Valley Water Users' Assn., Phoenix, has plans under way for extensions in transmission and distribution lines, with complete modernization of present lines throughout all areas, including power substation units and service facilities. Entire project is estimated to cost close to $5,000,000.

LOUISIANA—War Department, Washington, D. C., has authorized new air force base. Complete electrical equipment and facilities will be installed for industrial, airfield and residential service. Project will cost over $2.000,000, and will be supervised by U. S. District Engineer Office, Vicksburg, Miss.

KENTUCKY—Carbide & Carbon Chemicals Corp., 30 East 42d Street, New York, N. Y., a subsidiary of Union Carbide & Carbon Corp., same address, has closed agreement with government for construction and operation of new butadiene plant comprising several large one and multi-story processing and production buildings. Entire project is reported to cost over $5,000,000, financing by Defense Plant Corp. Ford, Bacon & Davis, Inc., 39 Broadway, New York, is consulting engineer. Work is scheduled to begin soon.

CALIFORNIA—Bureau of Reclamation, Denver, Colo., is scheduling work on Central Valley project, now in course of construction, to provide for installation of two hydraulic turbines and generators in Shasta hydroelectric power station by January, 1944, each of 75,000-kw. rating, and for a third such unit of same capacity in March, 1944; also, for two hydraulic turbines and generator units, each 25,000-kw. capacity, in Keswick station, in May and June, respectively, of that year. Units are expected to be ready for service in months noted. Bureau is asking bids until October 12 for four 50x50 ft. regulating gates for installation in spillway at Keswick dam. Equipment will be installed by Government (Specifications 1045). (Postponed from September 21).

NEW MEXICO—War Department, Washington, D. C., has approved plans for new air force base in Curry County, comprising a group of one and multi-story buildings, with hangars, shops and other industrial units. Complete electrical equipment and facilities will be installed for airfield, industrial and residential service. Entire project will cost over $3.000,000, and will be supervised by U. S. District Engineers Office, Albuquerque. Work is scheduled to proceed at once.

PENNSYLVANIA—United Engineers & Constructors, Inc., 1401 Arch Street, Philadelphia, has contracted with government for engineering and construction services for new manufacturing plant for war materials in Northumberland County, to be operated by another industrial company, name to be announced later. It will comprise several large one and multi-story buildings for main production service, with auxiliary structures for storage, distribution, etc. Cost over $5,000,000, with financing by Defense Plant Corp. U. S. District Engineer Office, Baltimore, Md., will supervise project.

TEXAS—U. S. Engineer Office, Citizens' National Bank Building, Denison, plans early call for bids for work and equipment in connection with Denison Dam and hydroelectric power project, now under way. Awards will cover part of program to be carried out during fiscal year and for which appropriation of $10,950,000 recently was authorized. Entire development will cost approximately $50,000,000 and is now about one-half completed.

CALIFORNIA—Southern California Edison Co., Los Angeles, has contracted with local District Office of U. S. Engineers for installation of an underground conduit system for light and power service at an aircraft-manufacturing plant in Southern California, including removal of existing overhead distribution system. Work is scheduled to be carried out at early date.

NORTH CAROLINA — Federal Works Agency, High Point, has plans maturing for additional construction and completion of hydroelectric power plant on Yadkin River, initially begun as a project of City of High Point and recently taken over by government. Plant is scheduled to be equipped for a capacity of 21.000-kw., to be increased at later date. Entire project is estimated to cost close to $8,000,000. W. R. Holway & Associates, 302 East Eighteenth Street, Tulsa, Okla., and Robert E. Lee Hotel, Winston-Salem (temporary office) are consulting engineers in charge of redesign and construction.

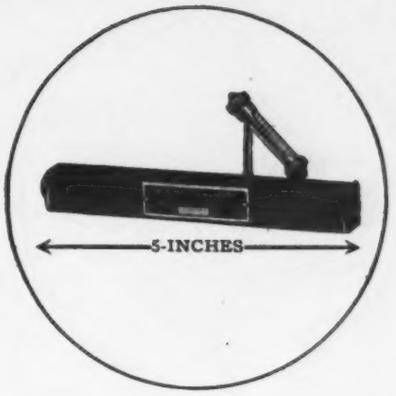
SOUTH CAROLINA — War Department, Washington, D. C., has approved plans for new air force base, consisting of a number of one and multi-story buildings, including hangars, shops and other industrial structures. Complete electrical equipment and facilities will be installed for industrial, airfield and residential service. A power substation and electrical distribution system are planned. Complete project will cost in excess of $3.000,000 and will be supervised by U. S. District Engineers Office, Charleston.

OHIO—Sun Oil Co., Toledo, has plans under way for large addition to oil refining plant, comprising a complete new unit for production of butadiene, a basic ingredient of synthetic rubber, for government. It will consist of several multi-story processing and production buildings, with complete electrical equipment and facilities. Cost reported in excess of $2,500,000, with financing by Defense Plant Corp. Initial unit is scheduled for completion in about six months. Main offices of company are at 1608 Walnut Street, Philadelphia, Pa.

MISSISSIPPI—War Department, Washington, D. C., has authorized new military post in Panola County, including series of buildings for general service, shops, warehouses and other industrial structures. Complete electrical equipment and facilities will be installed, with power substation and electrical distribution system. Entire development is estimated to cost over $2.000.000 and will be supervised by U. S. District Engineer Office, Vicksburg.

TEXAS—Civil Aeronautics Administration, Department of Commerce, Fourth Region, Fort Worth, plans installation of lighting system at new airport to be constructed. Proposed to ask bids soon (Invitation 443-892).

GEORGIA—U. S. District Engineer Office, Savannah, plans installation of night-lighting system in connection with airport development in Georgia, comprising runway marker lights, boundary lights, obstruction lights, underground cable installation, switching and control station, and other facilities. Bids are scheduled to be asked soon.



No Fallacious Guesses.

There is no guessing with a Matthews Teleheight. Any lineman can be taught to use it and get any height within an inch or so. He can learn in five minutes.

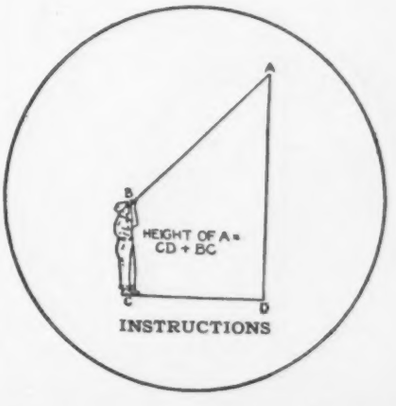
The extra cost of just one wrong guess will pay for one or two Matthews Teleheights. Hundreds of them are saving lots of money for their owners all over the country. Many are being used for quickly figuring the cubical contents of buildings, the clearance of bridges, highlines, etc.

Matthews Teleheight is only five inches long. Has no moving parts. It is furnished with a leather carrying case that will fit in the vest pocket. The drawing below shows how simple are the directions for using it.

Great for Appraisal Jobs.

Try one at our risk of your approval.

W. N. MATTHEWS CORPORATION
ST. LOUIS, U. S. A.



Southern Colorado in New Recap Plan

Southern Colorado Power Co., a direct subsidiary of the Standard Gas & Electric Co., has filed an amended plan with the SEC for reorganization and recapitalization of the company on an all common stock basis, supplementing one filed July 2 (ELECTRICAL WORLD, July 11, page 74) which would have provided for preferred stock in the new capitalization of the company. Filing of the new plan has caused the commission to postpone hearing on the matter from September 30 to October 6.

The amended plan calls for the redemption of $6,763,400 first mortgage 6 percent bonds, due July 1, 1947, by the issuance of $5,500,000 of first mortgage 3½ percent, 30-year bonds and $1,200,000 of ten-year, 3 percent serial notes, together with approximately $100,000 in cash on hand available for such use. The presently outstanding 7 percent cumulative preferred stock, class A common stock and class B common stock will be reclassified into 452,160 shares of new common stock, par value $10, or a total of $4,521,600.

The 452,160 shares of new common stock will be distributed to the holders of the 7 percent cumulative preferred as follows: Ten shares of new common for each share of 7 percent cumulative preferred and all accumulated and unpaid dividends; one-fifth share of new common for each share of class A common; one-fifteenth share of new common for each share of class B common. Under this arrangement, the three present classes of holders will receive, respectively, 425,160 shares, 22,000 shares and 5,000 shares of new common.

•

G.E. Salvage Program

General Electric Co. will recover and return to war production this year 380,000,000 pounds of waste material, according to H. J. Beattie, head of the company's salvage department. Approximately 80 percent of the total tonnage collected by the salvage department is steel scrap. Aluminum, tin, lead, copper, zinc, solder, brass and babbitt comprise 12 percent of the scrap by weight and 56 percent by value.

•

Useful Government Pamphlet

Every company dealing directly or indirectly with the Army, Navy or Procurement Division of the Treasury Department, as contractor or sub-contractor, should procure a copy of a government pamphlet wherein may be found, for the first time in printed form, a definite outline of the manufacturing and other contract performance cost items and expenses of an administrative and distribution nature which are allowable under contracts with these three government agencies.

The pamphlet, entitled "Explanation of Principles for Determination of Costs Under Government Contracts," may be obtained from the Superintendent of Documents, Washington, D. C., for 10 cents.

BOOKS RECEIVED

American Electricians' Handbook—5th Edition. Terrell Croft; revised by Clifford C. Carr. McGraw-Hill Book Co., New York. 1634 pages, illustrated. Price $5.

Expansion in this fifth edition has added 50 percent of applicable data for the electrician by inserting four new sections to the former six. One consists wholly of circuit calculations, one is devoted to distribution wiring, one to equipment and batteries, another exclusively to the properties of conductors and their splicing technique and the fourth to an improved array of wiring tables. Customary sections on rotating equipment, transformers, outside distribution and lighting have been expanded and modernized. The best of the old practice has been augmented by the soundest of the new.

Fundamentals of Electric Waves. Hugh Hildreth Skilling. John Wiley & Sons, New York. 186 pages, illustrated. Price $2.75.

Conceived and executed as an introduction to basic wave phenomena and thus essential to a study of the microwave and ultra high-frequency echoes which are now so important in military detection; also treats merits of antennas, wave guides, resonators and horns. Relies on calculus and vectors.

Plane Trigonometry Made Plain. Albert B. Carson. American Technical Society, Chicago, Ill. 389 pages, illustrated. Price $2.75.

Holds to the promise in the title and is thus well gauged, for example, to the meter engineer who aims to adopt vectors as a working tool and, accordingly, needs an elementary knowledge of trigonometry. There are 110 pages of logarithm and function tables.

New Technical and Commercial Dictionary. Compiled by Antonio Perol Guerrero. Published by Chemical Publishing Co., Brooklyn, N. Y. 600 pages. Price $10.

Prospect of enlarged trade with Spanish-America makes this 50,000-word volume most timely. These words are from the vocabulary of commerce and technology; conscious effort was evidently made to exclude terms of non-commercial significance without omitting the parlance of selling, shipping and billing. Military, chemical, agricultural and other fields are recognized, of course, as well as electrotechnical terms, but that the electrical is accorded proportionate entries, there may be mentioned the following spotted in the English b-section; back emf, balancer, bandpass filter, battery, B & S wire gauge, bridge, brushholder, bulb, busher. Conversion values for currency and for weights and measures are tabulated in an appendix.

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